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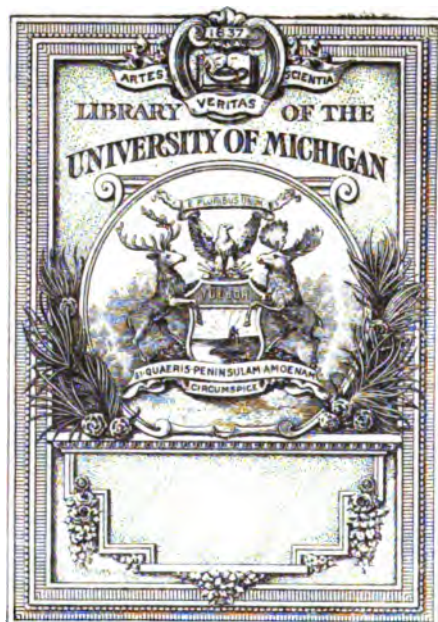
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# Archives of Medicine

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DEVOTED TO ORIGINAL COMMUNICATIONS ON MEDICINE,  
SURGERY, AND THEIR SPECIAL BRANCHES

EDITED BY

E. C. SEGUIN, M.D. AND R. W. AMIDON, M.D.

S'il est possible de perfectionner l'espèce  
humaine, c'est dans la médecine qu'il faut  
en chercher les moyens.

—DESCARTES

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# ARCHIVES OF MEDICINE.

## Original Articles.

### THE INTERNAL CAPSULE OF THE CEREBRUM AND THE DIAGNOSIS OF LESIONS AFFECTING IT.\*

By AMBROSE L. RANNEY, M.D.

IN connection with the description of the so-called basal ganglia (the "corpus striatum" and "optic thalamus" of each hemisphere), I have mentioned a tract of fibres, called the "internal capsule of the cerebrum." This bundle has an anatomical peculiarity, which has brought it into prominence with both physiologists and neurologists, viz., that it seems to traverse the substance of the basal ganglia without any apparent structural relation with the nerve-cells found within them. It is by no means certain that the nerve-cells referred to may not, in some indirect manner, be yet proven to modify or govern the impulses which travel along the fibres of the internal capsule (as we have every reason to believe they do in the case of other fibres which pass from the cortex to the crus, pons Varolii, and spinal cord); but, at present, we are compelled to admit that this bundle appears to afford the only *direct communication* between the convolutions and parts below the cerebrum,<sup>1</sup> because any intervention on the part of the corpus striatum

\*A lecture delivered before the class of the Medical Department of the University of the City of New York, during the session of 1882-83.

<sup>1</sup> The fibres of the "external capsule of the cerebrum" may be an exception. (Fig. 1.)

or the optic thalamus has not been conclusively demonstrated.

This tract seems to be a continuation of both the *motor* and *sensory* portions of the crus (the "basis cruris," and "tegmentum cruris," of Meynert—see Fig. 3) into the white substance of the cerebral hemisphere of either side, where its fibres diverge and pass to the convolutions. It forms the greater part of the so-called "corona radiata," which was described in a previous lecture.<sup>1</sup> If we trace the anterior fibres of this bundle from below upward, we shall see that it divides the corpus striatum of each hemisphere into its two portions, the caudate and lenticular nuclei. Its posterior fibres separate the lenticular nucleus from the optic thalamus of the corresponding side. The diagram, to which I now direct your attention, will make the relations

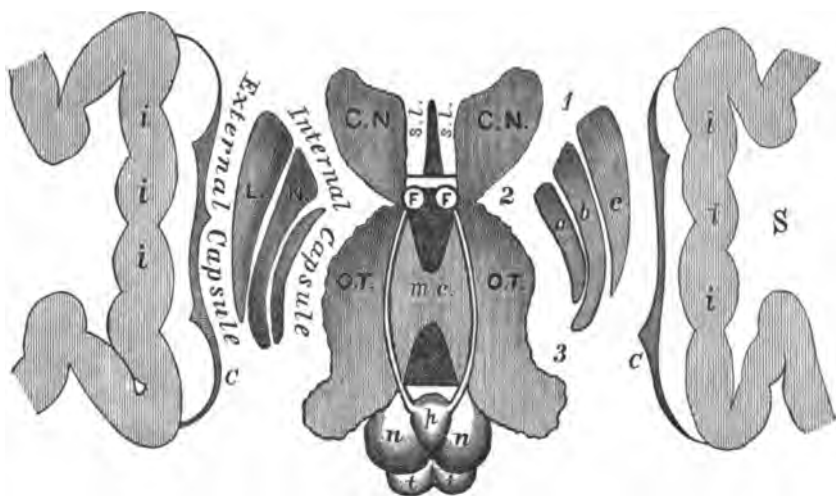


FIG. 1.—A DIAGRAM DESIGNED TO SHOW THE RELATIONS OF THE INTERNAL CAPSULE OF THE CEREBRUM TO ADJACENT STRUCTURES VIEWED FROM ABOVE. The section of the brain has been made *horizontally* in a plane to intersect the basal ganglia. C. N., caudate nucleus of corpus striatum; L. N., lenticular nucleus of same with its three parts (a, b, c); O. T., optic thalamus; S, fossa of Sylvius; C. claustrum; E. C., external capsule of cerebrum; i, i, i, convolutions of the island of Reil; a, b, c, the inner, middle, and external member of the lenticular nucleus; 1, anterior limit of the internal capsule; 2, "knee" or bend of same; 3, posterior limit of same; F, crura of fornix, the fifth ventricle lying in front, and the third ventricle behind it; s. l., septum lucidum, showing its two layers with fifth ventricle between them; m. c., middle commissure of the thalamus; p, pineal gland and its peduncles; n, nates cerebri; z, testes cerebri.

<sup>1</sup> *N. Y. Med. Jour.*, April 16 and 24, 1883.

of this bundle apparent, while it will also show the peculiar angle or bend which the internal capsule exhibits in all horizontal sections of the brain which intersect the basal ganglia.

Now, if a cross vertical section of the cerebral hemispheres be so made (see Fig. 2) as to include the substance of the thalamus and the lenticular nucleus, it will be perceived that the peripheral outline of these two masses of gray matter may be compared to a square; and that a diagonal band running from the outer and upper corner to the lower and inner corner of this square corresponds to the situation of the compressed portion of the "internal capsule," which is included between these ganglia. Above the level of the basal ganglia, the fibres of the internal capsule radiate to join certain convolutions or "gyri" which will be enumerated later. Thus it is that the fibres of the internal capsule appear in most of the cross-sections of the middle zone of the cerebrum to bear a resemblance to the handle and sticks of a Japanese fan; the handle being the constricted portion between the corpus striatum and the optic thalamus, and the diverging fibres being located within the medullary centre of the cerebral hemisphere.

The extension of *sensory fibres* from the tegmentum cruris upward within the internal capsule of the cerebrum is not so clearly proven as is the continuity of the *motor tract*, anteriorly. The course of the former has been studied by dissection, embryological investigation, physiological experiment, and, finally, by the examinations of pathological processes. It has been shown by Türck<sup>1</sup> that, when certain convolutions of the brain (chiefly those which are motor in function) have suffered partial or complete destruction, that a *descending degeneration* follows the course of the nerves

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<sup>1</sup> This author first made known his great discovery to the Academy of Sciences of Vienna, in 1851.

which are connected with the cells of the injured part. This degenerative process extends along the nerves, from the cells of the cortex, to their peripheral terminations, in the cells of the spinal gray matter; thus enabling a careful observer to trace the paths of the fibres with even greater

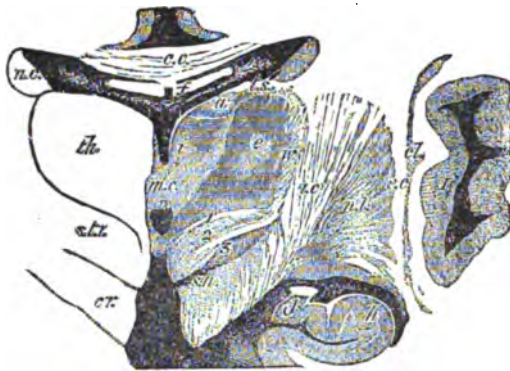


FIG. 2.—SECTION ACROSS THE OPTIC THALAMUS AND CORPUS STRIATUM IN THE REGION OF THE MIDDLE COMMISSURE. (Schäfer after a preparation by Mr. S. G. Shattuck.) Natural size. *th.*, thalamus; *a., e., i.*, its anterior, external, and internal nuclei respectively; *w.*, its latticed layer; *m.c.*, middle commissure; above and below it is the cavity of the third ventricle; *c.c.*, corpus callosum; *f.*, fornix, separated from the third ventricle and thalamus by the velum interpositum. In the middle of this are seen the two veins of Galen and the choroid plexuses of the third ventricle; and at its edges the choroid plexuses of the lateral ventricles; *t.s.*, tænia semicircularis; *c.f.*, forward prolongation of the crura passing laterally into the internal capsule, *i.c.*; *s.f.r.*, subthalamic prolongation of the tegmentum, consisting of (1) the dorsal layer, (2) the zona incerta, and (3) the corpus subthalamicum; *s.n.*, substantia nigra; *n.c.*, nucleus caudatus of the corpus striatum; *n.l.*, nucleus lenticularis; *e.c.*, external capsule; *cl.*, claustrum; *i.*, Island of Reil.

accuracy and positiveness than the most skilful dissector could possibly hope to attain. By means of this fact,<sup>1</sup> amplified somewhat by Waller, physiologists have been enabled to solve many problems regarding the origin and course of special nerves, as well as of certain nerve-tracts within the spinal cord and brain, which could not otherwise have been determined.

Although the remarkable observations of Türck were given to the profession some years before Waller was awarded the honor of meriting recognition as the recipient of the Moynton prize for Experimental Physiology, his

<sup>1</sup> The reader is referred to a lecture upon the "Wallerian Method of Research," by Prof. Dalton. *Med. Record*, Feb. 11, 1882.

paper remained comparatively unknown for some years, when its great value at last became recognized. The difference between the discoveries of Waller and Türck lie in the fact that the observations of the former were confined to the results of artificial section of spinal nerves, made for the purpose of studying the effects of such injuries, while those of Türck were of a purely pathological character, in which the results of old morbid deposits within the substance of the brain were studied by the aid of successive sections of the brain and spinal cord at different levels, which could be contrasted with each other. Both of these observers arrived at the same fundamental law, viz., that injuries of nerves or of nerve-tracts cause a degenerative process which extends along the separate nerve-fibres to their ultimate ramifications.<sup>1</sup> Waller's experiments were confined exclusively to the spinal nerves, and resulted in the following deductions: 1, That if the nerve was divided at its exit from the vertebral canal, *all of its ultimate fibres degenerated* for its entire length; 2, that if the anterior root of the nerve was alone divided, only the *motor fibres* degenerated; 3, that if the posterior root of the nerve was severed outside of its ganglion, the *sensory fibres* of the nerve degenerated and the motor fibres remained unaffected; 4, that if the posterior root was divided *internal to its ganglion*, the nerve outside of the ganglion did not degenerate, but the portion which was still attached to the spinal cord, but separated from the ganglion, suffered complete degeneration. From these data, this observer was enabled to lay down the general law that *the motor fibres of the spinal nerves are dependent for their structural*

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<sup>1</sup> Nerve-fibres degenerate only when severed from their connection with some special nerve-centre. When once cut off, the degenerative process extends throughout the entire length of the nerve; unless it meets another nerve-centre (some ganglionic mass of gray substance) interposed in its course. It seldom, therefore, extends from spinal nerve-tracts into the spinal nerves, or *vice versa*.

*integrity upon their connection with the spinal cord, while the sensory nerve-fibres depend upon their connection with the spinal ganglia.*

The degenerative process which was recognized by both Türck and Waller consists in the production of granular cells along the course of the affected nerve-fibres. The unaffected fibres retain their normal appearance, and thus define the diseased bundles so that they can be traced along the spinal cord and peripheral nerves with great accuracy. Türck was enabled by this means to demonstrate for the first time a distinction between the anterior and posterior segments of the lateral column of the spinal cord, which no ordinary dissection could possibly have established. The observations of Türck have been supplemented by those of Goltz, Gull, Flechsig, Meynert, Bourdon, Charcot, and others, who have added much to our knowledge of the situation and functions of the various spinal nerve-tracts.

This digression will enable you to appreciate the grounds which now enable us to speak with a certain degree of positiveness concerning the course of motor nerve-tracts, comprised within the anterior two thirds of the internal capsule of the cerebrum. I designate the limits of the motor fibres of this bundle somewhat definitely, because it is now generally accepted among neurologists that the *posterior one third* of the internal capsule contains *sensory bundles*, while the *remaining two thirds* has a purely *motor* function.

Now, because motor fibres carry centrifugal impulses, it is logical to describe the motor bundles of the internal capsule from the above downward, beginning with an enumeration of the convolutions from which the motor fibres are believed to spring, and tracing the course of these fibres to their connection with the cells of the anterior horns of the

spinal gray matter, while it is customary to reverse the method, in case the sensory fibres, which carry centripetal impulses, are under consideration.

The diagram to which I shall first call your attention was designed by its author to rudely represent the general features of the internal capsule. It is impossible to properly portray all of the more important facts, to which I shall call attention, by any form of schematic drawing; so that the diagram offered, which is most excellent of its kind, cannot

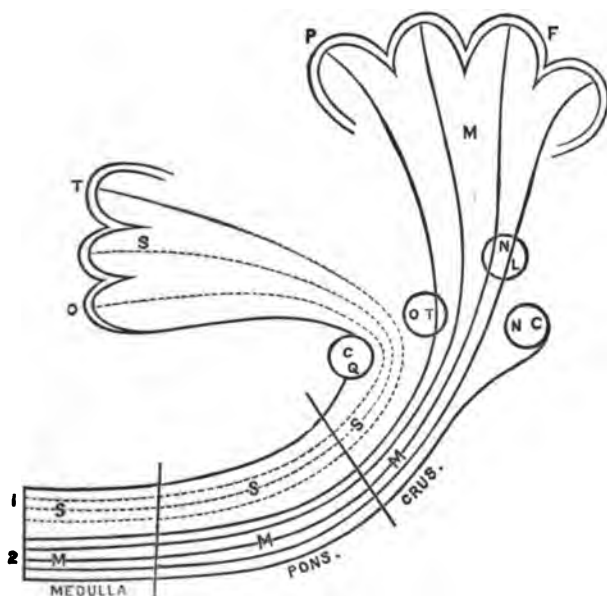


FIG. 3.—DIAGRAM OF THE COURSE OF SENSORY AND MOTOR TRACTS IN THE MESOCEPHALON AND HEMISPHERES. (Seguin.) S, sensory tract in posterior region of mesocephalon, extending to O and T, occipital, and temporal lobes of hemispheres; M, motor tract in basis cruris, extending to P and F parietal and (part of) frontal lobes of hemispheres; C. Q., corpus quadrigeminum; O. T., optic thalamus; N. L., nucleus lenticularis; N. C., nucleus caudatus; 1, the fibres forming the "tegmentum cruris" (Meynert); 2, the fibres forming the "basis cruris" (Meynert).

more than afford general hints of value, and should be used as a guide only in contrast with more elaborate cuts found in standard anatomical works.

The *motor bundles* arise from the cells of the cerebral cortex comprised within the convolutions of the middle

region of the brain. This region—the so-called “motor district”—includes the *ascending frontal gyrus*, the *basis of the first, second, and third frontal gyri*, the *ascending parietal gyrus*, the *paracentral lobule*, and the *supra-marginal gyrus*.<sup>1</sup> Some of these bundles pass directly into the substance of the caudate nucleus, some into the lenticular nucleus, and possibly a few into the optic thalamus of the corresponding hemisphere, after traversing the medullary centre of the cerebrum; but the majority appear to be directly continuous with the constricted portion of the internal capsule.

The *sensory fibres* which are comprised within the internal capsule are probably prolonged upward from the posterior parts of the crus (tegmentum cruris cerebri—Fig. 3) to the convolutions of the occipital, temporo-sphenoidal, and parietal lobes. It is believed, however, that the posterior third or (sensory portion) of the internal capsule has connections also, by means of the optic, olfactory, gustatory, and acoustic nerves, with the peripheral organs of special sense. Physiological experiment has shown that, when certain convolutions of the sensory regions of the cerebral cortex have been destroyed in animals, the senses of sight, smell, hearing, and taste have been either temporarily or permanently impaired. We know also that total hemianæsthesia results from lesions, both in man as well as animals, which involve the posterior third of the internal capsule. The impairment of special senses from cortical lesions, moreover, appears to be confined to the side opposite to the seat of injury, in case of unilateral destruction of the cerebral convolutions—phenomena which point strongly to a decussation of these fibres, in which respect they bear an analogy to the common sensory tracts. Future consideration will be given to these points. Some

<sup>1</sup> The late work of the author “The Applied Anatomy of the Nervous System,” D. Appleton & Co., New York, contains numerous diagrams which illustrate these parts. The term “gyrus” is synonymous with “convolution.”

of them, particularly bearing upon the location of an olfactory, optic, and acoustic centre, within the substance of the thalamus, have already been discussed at some length in a previous lecture.<sup>1</sup>

When we discussed the corpus striatum, I constructed for you a diagram which represented the afferent and efferent fibres of that ganglion, in which the motor fibres of the internal capsule were shown. I stated, at that time, that the functions of the caudate and lenticular nuclei were still unsettled, but that anatomical grounds could be advanced to sustain the belief that the cells of both halves of that ganglion exercised a modifying and controlling influence upon motor phenomena, and were probably the seat of automatic action, irrespective of the cells of the cerebral cortex. I stated, also, that it was demonstrable that the cerebellum had a direct connection with the cells of the caudate nucleus, and that physiological experiment pointed strongly to cerebellar innervation of motor acts, because disturbance in coördination of movement are produced by disease of the cerebellum, and motor acts appear to be weakened. Now, because experiments made upon the caudate and lenticular nuclei can hardly be said to have afforded results which can be made the basis for positive deductions respecting the functions of each, it seems highly probable that the cerebellar fibres are in some way connected with those of the internal capsule, which are unquestionably associated with motor phenomena.

Among the afferent fibres of the corpus striatum, in addition to the cerebellar fasciculus (fibres of the *processus cerebelli ad cerebrum*), may be mentioned the "corona radiata," the "stria cornea," fibres from the cortex of the olfactory lobe, and fibres from the septum lucidum.<sup>2</sup> If it

<sup>1</sup> The reader is referred to a late article by the author upon "The Optic Thalamus," *Journal of Nervous and Mental Disease*, April, 1883.

<sup>2</sup> *Journal of Nervous and Mental Disease*, Jan., 1883.

can be shown that these five sets of afferent nerves become associated with those of the internal capsule, it will help us

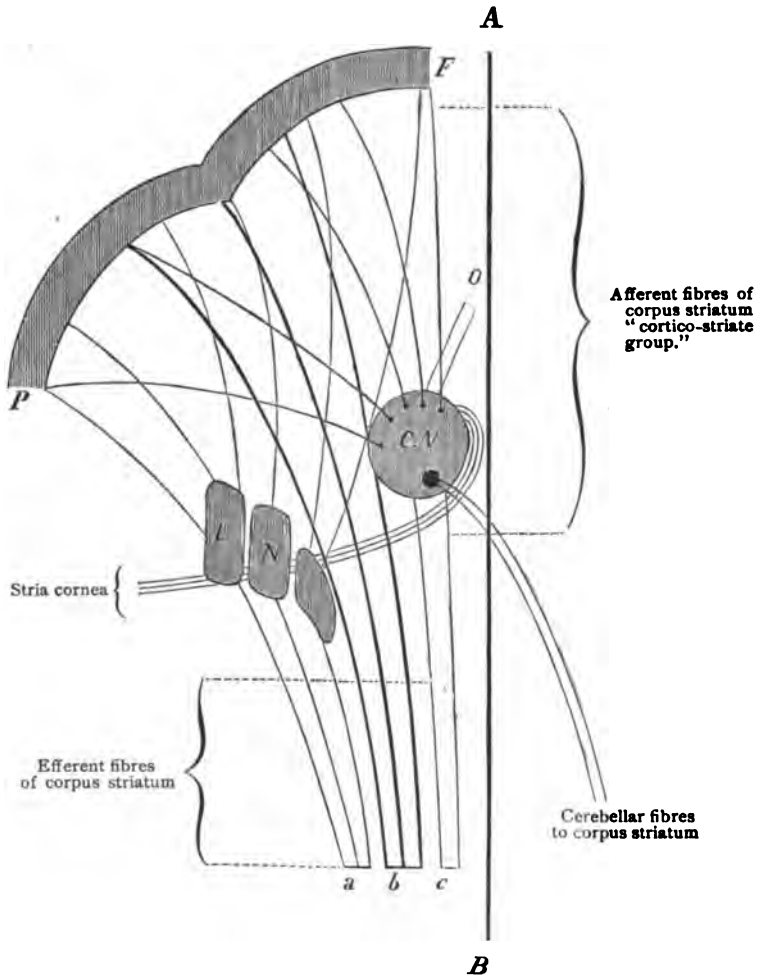


FIG 4.—A DIAGRAM DESIGNED TO SHOW THE AFFERENT AND EFFERENT FIBRES OF THE CORPUS STRIATUM. *C. N.*, "caudate nucleus," or ventricular portion of corpus striatum; *L. N.*, "lenticular nucleus," or extra-ventricular portion of corpus striatum; *A—B*, median line, separating cerebral hemispheres; *P—F*, psycho-motor regions of the cortex; *a*, peduncular fibres connected with *L. N.*; *b*, fibres of the so-called "internal capsule"; *c*, fibres connected with *C. N.*; *O*, olfactory fibres.

to better interpret the functions of the parts. The time has passed when any single experiment can be advanced to

prove the existence of isolated functions within ganglionic masses. Anatomical research has demonstrated that nerve-tracts frequently traverse these masses (without any apparent association with the cells embedded within them) in order to terminate in remote parts. It has been conclusively proven also that special centres are sometimes interspersed between these nerve-bundles, so that it is illogical to attribute every phenomenon caused by an intra-cranial experiment to a disturbance in the activity of any special centre. The physiology of many parts of the brain is far from satisfactorily marked out. Many glaring contradictions are apparently proven by the experiments of different investigators, and the statements previously made will help, to some extent, to explain them. I pointed out, when discussing the structural anatomy of the thalamus,<sup>1</sup> that, until the existence of the special centres, which are believed to exist by some authorities within that ganglion, could be positively demonstrated, it will be maintained by others that many phenomena which accompany lesions of the thalamus are due entirely to *pressure* exerted upon the adjacent internal capsule. This view is held also by many neurologists, when phenomena provoked by any experiment upon the corpus striatum<sup>2</sup> are adduced to prove a special function as located within that ganglion. Pathological research has, in some instances, seemed to oppose the view that the lenticular nucleus possesses any important motor functions. The French experimenters, Franck and Pitres, published in 1878 a most brilliant attempt to demonstrate conclusively that the anterior fibres of the internal capsule were continuous with the motor convolutions of the cerebrum and conducted motor impulses. These physiologists

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<sup>1</sup> See *Journal of Nervous and Mental Disease*, April, 1883.

<sup>2</sup> It is possible that the *caudate nucleus*, when seriously impaired by lesions, may cause hemiplegia and secondary degeneration. Charcot claims, however, that the effects of hemorrhage of the corpus striatum are to be attributed entirely to pressure upon the motor fibres of the internal capsule.

found that when the white substance of the cerebral hemisphere, which underlies the motor convolutions, was faradized, muscular movements were created on the opposite side of the body in definite regions corresponding to the supposed action of the so-called "motor centres" of the cortex. It must be confessed by all that these observations, which are considered by many as a final proof of the distribution and function of this bundle of fibres, are among the most satisfactory which have been as yet recorded.

Before we pass to the consideration of the internal capsule in its practical aspects, let us speak a little more definitely in regard to its exact situation and limits. This bundle, as was stated before, lies between the lenticular nucleus on the one side, and the caudate nucleus and the optic thalamus, on the other. Transverse vertical sections of the cerebrum show that the lenticular nucleus lies external to and below it, while the caudate nucleus and thalamus lie internal to and above it (Fig. 2). In the region of the base of the cerebrum, the head of the caudate nucleus becomes fused with the lenticular nucleus, so that the internal capsule does not extend to the extreme anterior limits of these ganglionic masses. The posterior limit of the internal capsule is defined by the termination of the lenticular nucleus; the thalamus being prolonged beyond it into the substance of the cerebral hemisphere. Above the level of the basal ganglia, the fibres of this bundle radiate into the different lobes of the cerebrum (Fig. 3); the anterior part of the frontal lobe, and some portions of the occipital and temporo-sphenoidal lobes, being possibly exempt.

To the naked eye, the fibres of the internal capsule, which pass between the ganglionic masses at the base of the hemisphere, appear to be continuous with the corona radiata above, and the fibres of the crus cerebri below. There is a general belief among anatomists, however, that

successive loops will probably be demonstrated by more extended research—the fibres of the crus leaving the internal capsule to join the cells of the basal ganglia, while others leave the ganglia to pass, by means of the internal capsule, to the cerebral convolutions. The results lately obtained by Franck and Pitres (mentioned on a preceding page), seem, however, to be rather opposed to this view, although they do not positively controvert it.

### *Effects of Lesions of the Internal Capsule.*

The situation of this bundle of nerve-fibres renders it liable to become directly involved when hemorrhage, softening, or tumors of the *central portions* of the hemisphere exist; or, indirectly, when these conditions affect the *caudate nucleus*, the *lenticular nucleus*, or the *optic thalamus*. The most frequent seat of cerebral apoplexy is the corpus striatum; because that ganglion is extremely friable and very vascular. The optic thalamus probably ranks next in the order of comparative frequency. The blood-vessels which enter these bodies<sup>1</sup> through the anterior and posterior perforated spaces at the base of the cerebrum seem to be frequently affected with atheromatous degeneration and miliary aneurisms, and are often ruptured when subjected to any unnatural strain. Nature has given to the carotid and the vertebral arteries a remarkable tortuosity before their entrance into the cavity of the cranium, in order, as it were, to diminish the liability to rupture of blood-vessels by decreasing the velocity of the flow when the heart's action is excessive; but even this mechanical safeguard is not always sufficient to protect the intracranial vessels from rupture when extensively diseased.

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<sup>1</sup> The motor regions of the cortex are supplied by the *middle cerebral* artery; the nucleus caudatus by branches of the *anterior cerebral* and *anterior communicating* arteries; the lenticular nucleus by the *middle cerebral*; and the optic thalamus by branches of the *middle* and *posterior cerebral* vessels.

Again, the condition of softening may result from embolic obstruction to some branches of the carotid (usually of the left side)<sup>1</sup> because the nutrition of the parts supplied by the occluded vessel is thus arrested either entirely or in part. The same result may also follow an attack of cerebritis or a previous extravasation of blood into the substance of the brain, both of which tend often to create impairment of the blood-supply to adjacent regions.

Finally, tumors sometimes develop within the cerebral hemispheres, and create pressure upon, as well as destruction of important nerve-tracts. Time will not permit us to enter into detail respecting all the diagnostic points by which the existence of each of these conditions may be recognized during life. I direct your attention, therefore, only to such points as are of importance in the diagnosis of disturbance of the supposed functions of the internal capsule.

It may be stated with some degree of positiveness that, if the anterior two thirds of the internal capsule be affected, a *hemiplegia* of the opposite side is developed.<sup>2</sup> This is more or less complete, according to the seat and extent of the lesion which causes it. The exciting cause may possibly be situated within the anterior or middle portions of the white centre of the cerebral hemisphere, above the level of the basal ganglia, in which case it interferes with the normal action of certain bundles of the internal capsule which spring from the motor convolutions of the cortex previously enumerated. Again, it may be situated within the constricted portion of the capsule, in which case bundles of nerve-fibres, functionally associated with widely diffused

<sup>1</sup> The reasons for this fact can be found in a late work by the author—"Practical Medical Anatomy." Wm. Wood & Co., 1882.

<sup>2</sup> Exceptions to this rule are occasionally observed. The hemiplegia, in rare cases, exists on the same side as the lesion. The explanation of this fact has been shown, by the researches of Flechsig, to lie in the varying proportions of the direct and decussating fibres which pass from the cerebrum to the spinal cord.

areas of the cortex may be affected by a lesion of small size. Finally, it may be apparently confined to the substance of one of the two nuclei of the corpus striatum (Fig. 5), or the optic thalamus, and still exert sufficient pressure upon the constricted part of the internal capsule to produce more or less extensive and complete paralysis of the opposite lateral half of the body. The hemiplegia of intracerebral lesions forms, as a rule, a striking contrast with the various types of *monoplegia*, which are produced by circumscribed lesions of the cortex. The latter are often of the greatest aid to the neurologist in localizing the seat of the exciting cause.<sup>1</sup>



FIG. 5.—A DIAGRAM OF THE BRAIN IN TRANSVERSE VERTICAL SECTION (MODIFIED SLIGHTLY FROM DALTON). 1, crus cerebri; 2, internal capsule; 3, optic thalamus; 4, caudate nucleus; C. C., corpus callosum; L. N., lenticular nucleus; S, fissure of Sylvius; F, gyrus fornix; F', F'', F''', first, second, and third frontal convolutions; T', T'', T''', temporal convolutions; H, gyrus hippocampi.

The second symptom which may indicate a lesion of the internal capsule is *hemi-anæsthesia*. By this, I mean a loss of sensation, more or less complete, which is confined to the lateral half of the body. It exists on the side opposite to

<sup>1</sup> The subject of *monoplegia* has been discussed, in all of its clinical aspects, by the author in his work previously referred to. The term covers many forms of paralysis where *special groups* of muscles are alone affected.

the seat of the lesion. This may occur when fibres of the *posterior third* of the internal capsule are destroyed or impaired by diseased conditions directly affecting them, as noted by Charcot, Raymond, Rendu, Ferrier, and others, or by the pressure exerted by lesions situated in parts adjacent to them. It is usually accompanied with a slight form of motor paralysis; probably because a few of the motor fibres of the internal capsule are, as a rule, simultaneously interfered with. The tests by which this condition may be recognized are, doubtless, familiar to you all. They were given you in detail in a previous lecture. No examination is ever complete unless sensation, as well as muscular power, is carefully tested, before a diagnosis is made.

A third symptom of lesions of the internal capsule includes a variety of manifestations of *impairment of the special senses*. In connection with the discussion of the optic thalamus, you will recall the views which I advanced respecting the possibility of existence of special centres of smell, sight, hearing, and sensation within the substance of that ganglion. I have also stated that some clinical facts point strongly to a relationship between nerve-fibres related to certain special-sense perceptions and the internal capsule. It is impossible, with our present knowledge, to definitely place the situation of the cortical centres which preside over the various special senses, or the course of separate fibres which seem to be associated with them, but we are forced to admit that some of the fibres of the posterior part of the internal capsule have a direct or an indirect association with smell, sight, hearing, sensation, and perhaps of taste also. During the last winter's course, I mentioned many interesting facts in physiology, which showed the value of abnormal phenomena in smell, sight, speech, hearing, taste, etc., upon the diagnosis of intracranial

lesions.<sup>1</sup> Many of these might be repeated here with advantage, if time would permit. One peculiar fact cannot be omitted, however, which Charcot has endeavored to explain, viz., that hemianopsia<sup>2</sup> never (?) occurs in connection with lesions of the internal capsule, but an amblyopia is developed on the same side as the cutaneous anæsthesia, with a remarkable contraction of the field of vision and difficulty in discrimination of color. The explanation which this author makes of this fact is, that a second decussation of the fibres of the optic nerve takes place somewhere between the optic chiasm and the internal capsule, probably in the tubercula quadrigemina.

When the radiating fibres of the internal capsule are involved in a lesion which creates a gradually increasing pressure (as in the case of tumors which grow slowly) the *fundus of the eye* exhibits morbid changes in the region of entrance of the optic nerve which are of value in diagnosis. The condition so produced is commonly known as the "choked disc." It is nearly always bilateral, but often most marked in one eye. It may be considered as one of the most positive signs of an extensive intra-cerebral lesion, and especially of tumors of the brain. When the eye is examined with an ophthalmoscope, this condition is characterized by a swollen appearance of the optic nerves, which project appreciably above the level of the surrounding retina; the margin of the disc is either obscured or entirely lost; the arteries appear small, and the veins large and tortuous; finally, small hemorrhagic spots may often be detected in the retina near the margins of the disc. In spite of this condition, the power of vision may be little impaired;

<sup>1</sup> See "Applied Anatomy of the Nervous System." D. Appleton & Co., N.Y., 1881.

<sup>2</sup> The term "hemiopia" signifies half sight; hemianopsia means a blindness of one half of the retina. The latter is, therefore, the preferable term in this connection.

so that the existence of "choked disc" may be unsuspected unless the ophthalmoscope be used before the diagnosis is considered final. After a number of weeks, and very much longer if a tumor is the exciting cause of the condition, the appearance of the disc changes. An unnatural bluish white color, which denotes atrophic changes, develops; the outline of the disc becomes sharply defined; the retinal vessels become small; and vision becomes markedly interfered with.

In exceptional cases of destruction of the internal capsule, the *sense of smell* has been abolished on the side opposite to the seat of the lesion. This fact requires special consideration, as it has been shown that the centre proper for olfactory perceptions seems to be in the hemisphere of the same side. Meynert claims, however, to have demonstrated the existence of an olfactory chiasm in the region of the anterior commissure, in animals where the bulbs are largely developed; and fibres have been traced in the region of the "subiculum cornu Ammonis," or the tip of the temporo-sphenoidal lobe, which connect the olfactory centres with each other. The experiments of Ferrier tend to disprove the decussation of the olfactory paths in the anterior commissure; so that the question still remains unsettled. The sense of smell is more commonly affected in the nostril of the side which corresponds to the seat of the lesion.<sup>1</sup>

Among the fibres of the internal capsule which are distributed to the temporo-sphenoidal lobe some appear to have some association with the *sense of hearing*; but experimentation upon animals to determine the exact seat of the centres of hearing and the effects of their destruction are exceedingly difficult, because the evidences of impairment of this sense are more or less vague. Ferrier thinks,

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<sup>1</sup> Ferrier reports a case where smell and taste were simultaneously abolished by a blow upon the top of the head. Ogle records a similar instance.

however, that the superior temporal convolution is unquestionably connected with acoustic perceptions. The area which he maps out as acoustic in function is quite extensive.

The region of the hippocampus seems to be chiefly connected with *tactile sensibility*, because its destruction has been found to create a total loss of that sense on the opposite side of the body (Ferrier).

As regards *taste*, the results of experimentation upon the monkey tribe seem to point to the lower portion of the middle temporal convolution as the probable seat of the centres which are related to that sense.<sup>1</sup> When this region is subjected to irritation, certain reflex movements of the lips, cheek, and tongue are observed, which seem to point to an excitation of the gustatory sense. Its destruction causes abolition of taste.

We have now considered three of the more prominent symptoms which are produced by lesions of the internal capsule, and I pass to a fourth, which I believe to be of great value in aiding the recognition during life of an extensive and rapidly developing lesion of the white centre of the cerebral hemisphere, viz., *conjugate deviation of the eyes and head*.

When, in connection with rapid softening or an extravasation of blood into the substance of the cerebrum above the level of the basal ganglia, this peculiar symptom is developed (either simultaneously with or following paralysis and coma), the patient's head and eyes will be observed to be turned constantly away from the paralyzed side and toward the side which is the seat of the lesion. Various attempts have been made by late authors to throw discredit upon the clinical significance of this symptom as particu-

<sup>1</sup> This may help to explain the fact that injuries received upon the vertex and occipital protuberance cause, in some instances, an abolition of taste. The temporal lobe being injured by concussion against the adjacent bone.

larly indicative of a lesion of the cerebral hemisphere, but I am convinced that it is a valuable differential sign. Ferrier has demonstrated that a cortical centre, which he locates in the first and second frontal gyri near to their bases, presides over conjugate movements of the head and eyes, and causes dilatation of the pupils. He attributes this symptom, when occurring in connection with hemiplegia of cortical or ganglionic origin, to the unantagonized action of the corresponding centre of the uninjured hemisphere, thus explaining the fact that the distortion is toward the side of the lesion. Clinical evidence of the correctness of this view has been brought forward by Hughlings-Jackson, Priestly Smith, Chouppe, Landouzy, Carroll, and others; and, in some cases reported, the situation of the lesion has been verified by pathological observation. The opportunity to record pathological observations upon cases where this symptom was well marked during life is, unfortunately for science, a comparatively rare one. It is impossible, therefore, to speak positively concerning the diagnostic value of this symptom, although the weight of clinical evidence seems to be strongly in its favor.

A fifth symptom, which points strongly to an existing lesion of the internal capsule, is *choreiform movements* following hemiplegia or hemianæsthesia. These movements vary in type and degree. In some cases, the movements exhibit the peculiarities of athetosis, the fingers or toes being thrown into active motions which cannot be controlled by the patient; in others, true ataxia may be developed; again, the spasmodic movements partake of the character of genuine chorea; finally, a tremor, more or less marked, may be detected.

It is not uncommon to find that both hemiplegia and hemianæsthesia may co-exist with these post-paralytic forms of spasmodic disease; but one usually overshadows the

other, the hemiplegia being, as a rule, the more marked. How we are to explain these late phenomena, is not definitely settled. They are probably to be classed with other morbid manifestations which paralyzed muscles sometimes exhibit, chiefly that of "late rigidity" so often seen, concerning the cause of which many conjectures have been advanced but nothing of a positive nature demonstrated.

Finally, it has been observed that lesions of the internal capsule, if very extensive, are often followed by a very marked *rise in the temperature* of the body. We have yet much to learn concerning the vaso-motor centres which are variously disposed within the substance of the brain and spinal cord.

The fact has been mentioned that the fibres of the internal capsule probably terminate, anteriorly, in the *motor convolutions* of the cerebral cortex. Although there are still some neurologists of note who deny the value of the late attempts of Fritsch, Hitzig, Broca, Ferrier, Charcot, Hughlings-Jackson, Pitres, Landouzy, Exner, Chouppe, and a host of others, to locate special centres within the convolutions of the cortex, clinical and pathological observations are constantly being brought forward in support of the more generally accepted views. The region which embraces these motor centres appears, however, to be somewhat limited. A critical review of recorded cases shows, I think, beyond cavil, that the white centre of each hemisphere of the cerebrum, as well as the cortex, may in some instances, be extensively diseased or injured without any motor or sensory results which can be determined. Pathological evidence seems to demonstrate, however, that the region so impaired must not be situated where the fibres of the internal capsule suffer destruction or pressure if we expect to meet with negative results. Abscesses of immense size have been found in the anterior part of the frontal lobe, as well as in

certain portions of the occipital and temporo-sphenoidal lobes without any sensory or motor paralysis during life to indicate the existence of such a lesion. Tumors, softenings, and the most severe types of traumatism have likewise occurred without creating serious effects.

In case of the occipital and temporo-sphenoidal lobes, to which some of the posterior fibres of the internal capsule are probably distributed, sensory and psychical symptoms have been observed by some to follow circumscribed lesions. A more careful consideration of such cases will perhaps demonstrate the functions of these convolutions more clearly, but at present they are somewhat conjectural. Some forcible arguments have been advanced of late to prove a relationship between the occipital lobes and the mental faculties in opposition to the more commonly accepted doctrine that the frontal lobes were those of intelligence. The temporal lobes seem to exert an influence upon the special senses of touch, smell, and hearing. The angular gyrus of the parietal lobe is probably associated in some way with vision. An apparent connection of the optic and auditory functions with the cerebellum and optic thalamus has been mentioned in previous lectures. The bearing of morbid phenomena of these special senses<sup>1</sup> upon diagnosis will be considered in detail later in the course.

In closing this important subject, let me suggest, that it is by no means certain that lesions, which primarily affect the constricted portion of the internal capsule, may not, in themselves, create sufficient pressure upon the corpus striatum and the optic thalamus to cause interference with the free action of some of the *special centres* which are believed to exist within those bodies. If this be the case, many of the interesting phenomena described during our

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<sup>1</sup> The reader is referred to the author's treatise upon nervous anatomy for information respecting these phenomena.

discussion of lesions of the optic thalamus, would *co-exist* with those symptoms of disease within the internal capsule already mentioned. Ritti's views respecting the relations of the optic thalamus to hallucinations, and those of Luys pertaining to its olfactory, optic, and acoustic functions<sup>1</sup> have a special interest in this connection.

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<sup>1</sup> *Journal of Nervous and Mental Disease*, April, 1883.

## THE PRACTICE OF GYNECOLOGY IN INSTITUTIONS DESIGNED FOR THAT PURPOSE.

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**D**URING the last decade of years so much has been done and said in regard to gynecology, that one of ordinary capacity has been hurried in trying to keep within sight of the leaders in this department. There has hardly been much breathing-time when we could weigh and measure the real value of the products of this rapidly growing section of science and art.

It is clearly evident, however, that the great achievements in this country have been largely surgical. The operations in gynecology which have been devised by American surgeons have attracted the attention of the profession in the Old World, and have been the means of bringing enterprising students from across the ocean to see our way of doing things. While all this is a source of gratification to us, there is still room for improvement in the general management of diseases of women. It is encouraging to see that there is a marked tendency toward more thorough and comprehensive methods of treating this class of cases. The very fact of this progress in surgery has tended to turn attention to that which is equally important, the general therapeutics of gynecology. It can be easily seen that there is need of an equal blending of the physician's knowledge and the surgeon's skill in managing many of the diseases of women.

The two must go hand in hand in order to do the best that can be done for this class of sufferers. While recognizing the fact that the competent gynecologist of the present time must exercise the function of the physician at the same time that he possesses surgical skill and dexterity, the question naturally arises whether such attainments are manifested by practitioners generally in this special department of our profession. Should the verdict be that surgical skill predominates, as I believe it does, it would be profitable to survey the general field with the view of ascertaining what the tendencies and prospects of the present are. It is far beyond my highest aspirations to settle this point, but still a free expression of opinions often starts trains of thought which lead to more light and clearer comprehension of any subject.

From the little that I have been able to gather from my own investigations, it appears that there is a great fund of valuable knowledge existing in our literature, but much of it is in fragmentary form and in need of classification and arrangement in order to make it available for those who are in search of material to satisfy the demands of every-day practice. Much, I might say most, of the general therapeutics which is of importance to the gynecologist, has been developed by those engaged in other departments of practice, the neurologists having contributed a praiseworthy share.

To group together some of the facts and briefly discuss some of the principles of therapeutics as applied in gynecology, is the chief object which I now have in view. In carrying out this idea, the general management so necessary to success in the surgery of gynecology will naturally come in for brief notice.

To give a basis for that which may be said about therapeutics, it is necessary to outline the constitutional condi-

tions generally found in the various classes of patients which come under the care of the gynecologist.

All such cases may be classed under three heads :

1. Imperfectly developed girls.
2. Invalid wives.
3. Those who suffer from the diseases incident to the climacteric period.

To present this in a form in keeping with the esthetics of the present age, I might say the constitutional diseases incident to the spring, summer, and autumn of woman's procreative age.

In each of the three classes given two well-defined varieties are found. Indeed, many subdivisions might be made and must necessarily be made in the refinements of practice, but for our present purpose two will do, viz. :

Those who suffer from deranged nutrition and general exhaustion resulting from organic disease of the sexual organs, and those who suffer from functional derangements and imaginary ills. Those familiar with these patients will easily recall examples of the three classes and the varieties of each, but in order to make this more clear a word of explanation may be added.

In the young who are imperfectly developed, either in their general organizations, or in their sexual organs, or both, the menstrual function is generally imperfectly performed. This, in time, leads to actual disease of the pelvic organs, which in time tends to derangement of the general health, and finally invalidism. This is more especially the case if to the imperfection of organization be added overtaxation from the cares and duties of ordinary life. In contrast to this variety of class first, we find the well developed who possess at puberty all the requisites for health and functional activity, but because they are placed under deranged

conditions of life, soon become enfeebled and hence develop disease.

Take a young lady capable of much functional activity, mental and physical, and deprive her of the means of physical exercise (as often happens, especially among the wealthy), and deranged nutrition soon follows. Add to this the stimulation of fashionable society, which excites without giving useful employment to use up the nerve-forces, and the system must sooner or later become deranged. Such young women, for want of something better to do, devote much of their time to introspection, and usually succeed in boxing the compass of symptomatology in a very short time. Such are the young ladies who fall into the hands of the gynecologist.

I may dispose of the second class by saying that it is out of this kind of material mentioned in class first, and under such conditions of life, that invalid wives are made.

Regarding the third class, a word only is necessary. If we exclude malignant disease which occurs at the change of life, there are but two varieties which interest the therapist, viz., those who suffer from exhaustion and have too much nervous irritability to retire from sexual activity in a graceful way, and those who suffer from excrementitious plethora.

In the general management of the cases now under consideration, the nervous system demands a large share of attention, and happily the resources of our art have been greatly developed in this department within a few years past. No longer ago than the time when I was a student of medicine, assafoetida and valerian were the chief remedies given to nervous women, so called, and if these did not cure them a change of air was advised as a last resort. Now all this is changed for the better, and the progress made has been chiefly through the labors of neurologists. It

does not appear that much has been accomplished by the gynecologists in this direction, except that the most advanced among them have been sagacious enough to take advantage of the therapeutics developed by those interested in the nervous system and its diseases.

On this account it might be well to refer you to works on neurology rather than to discuss this part of my subject. However, it may be well to briefly notice some points in the management of the nervous affections related to gynecology.

The first class given in our classification, viz., those suffering from nervous exhaustion, require rest, and to secure this they must be removed from the cares of life, whether that be the government of a family and household, or the duties of a profession or a business. Isolation is the first thing to be secured, and that for a time is all that is required in some cases. Those who are exhausted without being irritable will rest if they get a chance, but the majority require more than that. Many of those who require extra sleep are sleepless. They ought to be still, but prefer, in fact insist upon keeping on the "go," to obtain relief from the tortures of nervous irritability which appear to be aggravated by repose. Such patients require to be toned down to the point of repose. Quiet surroundings and a nurse who understands her business will do much to effect this, but still medicines are often necessary.

The great difficulty is to get such patients to sleep well without resorting to opium or chloral. In this connection I might modify the saying of Sancho and say: "God bless the men who invented the bromides!" They are a great boon in the management of such cases. This is so well known that I need only add that, in my observations, I have found that it is best to push the bromides carefully, but toward their full and specific effect, and to do this safely,

small doses of *nux vomica* should be given at the same time. While advocating the liberal use of bromide, I would say it should not be long continued. I rarely continue the use of this drug longer than a week or two, except it may be one dose in the evening to prolong the night's sleep. When bromide is not well borne, or does not give the desired effect, *cannabis indica* may be tried. *Conium* also does well and may be combined with camphor, croton chloral, lupulin, belladonna, and the like, but they may all be considered as substitutes to be used in rare cases when the bromides fail. Alcoholic stimulants may be mentioned only to say that, as a rule, they are not well borne. While they may quiet the nervous symptoms for a time, their effect upon the pelvic organs is usually unfavorable, so that what is gained in one direction is lost in the other.

Next to the bromides among nerve sedatives, and perhaps first among them, is massage. The introduction of this treatment into rational therapeutics was a most valuable contribution. It is employed usually to aid nutrition and for this purpose it is of great benefit, but it is an excellent nerve sedative. A skilful nurse can, by systematic manipulation, soothe the tegumentary nerves and produce that normal tiredness which invites rest and sleep. That which used to be the property of ignorant and designing magnetic rubbers is now modified and adapted to rational use. It is a stone which the builders rejected for a time, but now fills an important corner. This massage is true passive exercise, the only way that exercise can be given without exhausting or taxing the nerve-centres. By this means the muscular system can be toned down to the condition adapted to normal rest, and a like effect appears to be produced upon the spinal nerves. This therapeutic agent is of so much importance that reference will be again made to it as we proceed. This part of the subject would be incomplete

without mentioning electricity. That this agent is useful most practitioners will acknowledge. In my own practice I have not been satisfied that it accomplished very much, excepting in the class of cases next to be considered.

Those who suffer from functional derangements of the sexual organs and the nervous system because of imperfect development or misdirected and unoccupied nerve energies; in short, spoiled girls and women, require a very different course of treatment from those just considered. The great object is to find for them mental and physical employment which will turn their attention away from themselves. Here also isolation is an important factor, but it is not for the sake of rest, but change of occupation. To remove such cases from the influence of kind but unwise friends, and place them in the more wholesome society of a nurse and physician, is a great gain. And then their whole time should be profitably occupied. A large portion of the day should be devoted to the Turkish or Roman bath, and if there is a well-defined hysterical element present, the cold pack, shower bath, and needle bath may all be tried in turn. Gymnastic exercise, adapted to the condition of each patient is one of the most valuable means in the management of such cases. If there is any pelvic disease which forbids the use of the ordinary calisthenics, the extremities should be thoroughly exercised while the patient is reclining. There is no one agent so potent in relieving chronic congestion of internal organs as muscular exercise. It is equally efficient in quieting that nervous irritability which is expressed in the host of wandering aches and pains which torment this class of patients. The condition of a brain which has for a long time been wholly occupied in looking after the frailties of the body, can be greatly improved by directing the will-power to the exercise of the muscles. I frequently see women who, because of some

uterine displacement or subacute pelvic cellulitis, are directed to rest in bed without any mental or physical employment. Such imprisonment is sufficient to make an invalid of the best kind of human material. To keep an army in good condition requires constant occupation of officers and men, and this rule applies to many of our sick folks. Our medical literature could well afford to have a chapter on employment for invalids.

After muscular exercise, electricity comes in to fill up time, and is useful to that extent at least. Patients who have some hysterical elements associated with these diseases of their pelvic organs are usually most benefited by electricity. So says Rosenthal in his book on "Diseases of the Nervous System," and my own limited experience agrees with this.

So much, then, may be said about the treatment of the nervous systems, those who are perverted by unfavorable surroundings, but of course the ills of this class are not all imaginary. Some of them, perhaps many of them, are feeble and require medication. Soothing medicines and nerve tonics may all be required and should be employed.

Regarding the third class of cases, viz., those occurring at the change of life, little need be said regarding the nervous system. At the age of forty-five the nervous system has usually accommodated itself to circumstances and is less liable to functional disorders, hence the diseases occurring at the menopause are mostly due to derangements of nutrition, and may, therefore, be considered under that head.

The capricious stomachs of invalid women require much skill and careful treatment in order to make them do their duty. I fully recognize the fact that when the nervous system is quieted and diseases of the sexual organs are

relieved, many of the direct and reflex derangements of the stomach disappear. Still, this is not sufficient in all cases. Indeed, there are few cases which can be successfully managed without giving attention especially to the diet and primary digestion. Want of appetite and labored gastric digestion are the most prominent factors in such cases. Both of these are sometimes due to imperfect secretion of the digestive fluids, as indicated by coating of the tongue, feter of the breath, and constipation. This may be relieved temporarily by mild laxatives containing blue mass with ipecac. in small doses—mild saline laxatives and the like. In short, the treatment which is best adapted to relieve subacute gastric catarrh answers in the condition now referred to. To excite an appetite in these states is often difficult. The ordinary bitter tinctures often fail to wake up these irritable stomachs to their duty; in fact, they sometimes increase the trouble. The small quantity of alcohol contained in bitter tinctures often disagrees; the extracts which can be given in small doses often answer better. When the irritability of the stomach is marked, bismuth and the oxalate of cerium will sometimes enable the patients to take food when the ordinary stomachics fail. The digestion of food when it can be taken in fair quantities is often labored and slow. Abnormal fermentation often occurs, giving rise to flatulence.

Pepsin, which has been used so freely in such cases, is, I fear, certain only in disappointing those who use it for cases of this kind. Granting that a few grains of pepsin are capable of dissolving so many grains of albumen, the ordinary dose can do little in the way of digesting a good dinner. Theoretically this is true, and my own observations in the practical use of pepsin confirm the theory. Liquor pancreatus promises to be of more value, as it tends to aid the digestive ferments; but we have not had sufficient

experience with it in this country to speak positively regarding it. Perhaps the most important therapeutic means in the management of indigestion is the selection and the administration of food. I have long ago given up the hope of finding any bill of fare which would suit all varieties of dyspeptic women. I now occupy my time in trying to find suitable food for individual cases, and I find that each patient has her own peculiarities. There are a few rules which apply to a number of cases. For example, forced nutrition, as it is called, will answer in treating some of the broken-down nervous women, *i. e.*, giving food in small quantities at short intervals, so that an excess is given in a day. This has become fashionable because of its success in the hands of such men as Weir Mitchell and Alex. Hutchins, but it fails in many cases; at least, I have failed occasionally in the use of this method, and so have others. Dr. J. R. Chadwick, of Boston, in writing to me regarding a case which appeared to require forced feeding, stated that while she took food in large quantities, she lost flesh and strength until he gave up the effort and allowed her to follow her inclinations, and then she improved. Again, some, and in fact the majority, will do better if given food at short intervals, say every two or three hours, even if the whole quantity consumed in a day falls short of the usual quantity taken by a person in health.

From whatever way we view this subject, the chief fact comes up, *viz.*, that we must try all kinds of food and hold fast to that which answers best in each case. To do this, an unlimited supply of provision and a cook full of expedients and plenty of patience are requisite.

At the present time it may be said that the nursing of patients, so far as the selection and administration of food, is generally in advance of the other equally essential factor of nutrition, *viz.*, the demand for food on the part of the

tissues. It is often more difficult to create a demand than to obtain a supply. Primary digestion is often retarded because of imperfect assimilation and elimination. So long as nutrition is sluggish, it is vain to try to improve the appetite and primary digestion and maintain them in good order for any length of time. The tissues generally must be kept in healthful activity in order to keep up the demand for food. Patients who are unable to exercise themselves must be exercised. When the nervous system is incapable of active exertion by reason of disease or exhaustion, extrinsic force must be brought to bear upon the tissues of the body to secure their healthy exercise. For this purpose massage, baths, and electricity should be used. These agents have been spoken of already as sedatives, but their greater value is their power to stimulate ultimate nutrition. By a good vigorous manipulation the nurse does for the patient that which she is unable to do for herself, stimulates the circulation, exercises the muscles, hastens disintegration, and creates the demand for fresh supplies of nutriment, and all this while the nervous system of the patient is enjoying repose. The Turkish bath causes that free elimination which could only be produced by violent exercise, a luxury beyond the reach of a patient with a retroverted uterus and a pair of inflamed ovaries. If to massage and the bath be added a full supply of fluids to keep the kidneys active, and a tonic laxative to keep the bowels regular, if that is necessary, the higher demands in the management of such cases will be fulfilled. There are many other minor demands which can easily be fulfilled by the practitioner in the actual duties of practice which need not be referred to here.

While all these and many other means are being employed to restore the general health, surgical treatment necessary to relieve such local diseases as may exist can be employed to far the best advantage. The highest success can only be

attained by a happy combination of local and general treatment. I hold that the specializing of the several branches of medicine and surgery, which is being developed everywhere in this age, is the highest evidence of true progress. We know that the artisan who devotes his whole attention to a given department of art can acquire a skill which the Jack-of-all-trades can never know. There is, however, a danger of the specialist becoming too circumscribed in his practice. It is possible by long application for one to become profoundly wise in one direction and idiotic in another.

To carry out a systematic course of treatment such as has been briefly referred to here is difficult, wellnigh impossible, in general practice. Granting that one has the requisite medical and surgical knowledge, it is almost impossible to obtain the means necessary. In private practice it is seldom that *proper nursing* can be obtained. There are few who can afford a well-trained nurse for any great length of time, and if that obstacle be overcome the constant interference of relatives and friends thwart the efforts of both physician and nurse to obtain and keep complete control of the patient. Private houses are generally ill-constructed for the care of the sick, and hence much of the doctor's time is lost in treating uterine disease, and the results are unsatisfactory. The time required of both doctor and nurse to care for one isolated patient is equal to that required to care for four if grouped together.

The fact is, that the only way to manage this class of patients with advantage to themselves and satisfaction to the physician, is to treat them in an institution specially arranged for that purpose.

All those who have had experience in the care of those who suffer from disease, other than trivial ailments, know well that they can be better managed in proper institutions than in private houses. This has been demonstrated be-

yond all doubt, and the tendency of the present age appears to be more and more toward the establishment and encouragement of such institutions. If this is true, and I believe it is, we may as well fall in with the current and be among the progressive men in the ranks of the profession.

There is among the people still some prejudice against institutions for the care of the sick, but this arises from the fact that such places have been used in the past for the poor only. The very poverty of such hospitals has often led to misusage in overcrowding, poor feeding, poor nursing, and so on. But the principle of having institutions for the care of the sick is sound. Now that we are beginning to have proper places for the care of the sick, the rich and intelligent are beginning to see the advantages of them. There are certainly good reasons why rich and intelligent parents should send their sons or daughters to institutions for the treatment of disease, or to schools for physical culture. They freely send them to boarding-schools for mental education.

The advantages of such institutions are many. They can be constructed upon the best sanitary principles and adapted to the wants of the sick. The progress in sanitary architecture made in recent times makes it possible to construct a building which will, to a large extent, guard the inmates from the causes of disease which are generated by their own eliminations. Such a building can also be adapted to the requirements and comforts of the sick. A house suited for a family home is not well adapted to the accommodation of patients. The order and government of such a hospital can be made agreeable to the suffering inmates, both as regards quiet and also cleanliness, which includes sewerage and ventilation. Diet also can be regulated according to the laws of health, and made agreeable and tempting to the

capricious appetites of patients. When the sole object of the establishment is to improve the health of those who dwell in them, and where the physician and surgeon and their attendants have the controlling power, a condition of hygiene is secured which is all but impossible in a private family.

In such an establishment the doctor has great advantages. His patients being brought together he can attend a larger number in shorter time. He also has a more perfect control of all their doings. He is within easy call of his surgical cases, and can therefore guard them from accidents and dangers which are liable to occur after operations. I have known severe cases which have been saved by the surgeon of the institution being on hand to promptly arrest hemorrhage. Such cases would surely have died if they had been in their homes and at a distance from the surgeon. This only illustrates a principle which has many ways of application. In this country and in Europe we find that the foremost men among specialists have their private institutions for the care of their patients. That such institutions are successful and advantageous to patients and physician, is a fact beyond all question. That more of them are needed is also a fact, the proof of which is found in another fact, viz., the prosperity of institutions under the care of half-educated men who practically carry out but one idea in the treatment of diseases, like hydropathic establishments, for example. For many years such places have been crowded by invalids in search of health. Rather than waste energy in declaiming against such places, it would be better for the profession to recognize the good that is in them and erect institutions upon proper scientific principles to take the place of those which have for a long time been the only resorts open to responsible sick people.

There is still another argument in favor of such institutions, and that is, the progress in the science and art which has been made in hospitals in the past history of the world. Much of all that is valuable in medicine and surgery has originated in hospitals and charity institutions. The Women's Hospital in New York, for example, has given more to the surgery of gynecology than all the private practitioners in the world. This statement, which is rather sweeping, is not intended to take from the honor due to those who are wholly engaged in private practice. Those who have hospitals at their command have no more brains than those who have not, but the advantages of the one class affords the opportunities of developing new ideas in practice which cannot be obtained in private practice,—at least to the same extent. The history of medicine and surgery abundantly shows that the leaders in our profession have been men who enjoyed the advantage of hospital practice. True, the hospitals in which these men have labored have been charity institutions, many of them poorly adapted to the wants of patients. In fact, at the present time, many of our hospitals are so poor that the physicians and surgeons are hampered in their efforts, and still the results obtained are, in many cases, superior to that obtained in private practice. In our best charity hospitals the patients obtain better chances than the rich do in their luxurious homes. It is now surely true that the rich, or well-to-do people, who are able to pay for proper care when they are sick, should have the advantages which the poor irresponsibles only can command.

This argument may call up the counter-statement that there are dangers in hospitals unknown in private houses. This is true of some hospitals. The crowding together of all kinds of diseases and injuries in rooms that are too small and badly constructed, tends to develop and spread diseases,

but in structures built upon sanitary principles, in which diseases and injuries are properly classified, all these dangers can be avoided.

There are now some important movements on foot to extend the hospital accommodations for the poor. Notably among these is that by Dr. A. Jacobi, who asks the State to give hospitals for poor children suffering from contagious diseases, so that the sick can be well cared for and the well ones protected from contamination. Let me earnestly express the hope that private individuals may be prompted to take steps toward securing such institutions as the more favored classes require.

We have health resorts, so called, where the sick may go in summer and winter, but they are mostly away from the cities and out of the reach of those who most need them. They are also under the control of hotel-keepers, who cannot make their houses to fully suit the demands of the really sick. May we soon have institutions in our cities under the management of responsible members of the medical profession, in which those who need special care can have all that science and art can afford them.

# THE EXCRETION OF PHOSPHORIC ACID BY THE KIDNEYS AS AFFECTED BY MENTAL LABOR.\*

BY DR. ROBERT T. EDES,  
PRESIDENT OF THE AMERICAN NEUROLOGICAL ASSOCIATION.

THE present note is intended to give the results of a few experiments upon the excretion of phosphoric acid in relation to mental work.

It has seemed to the writer that there is a strong semi-popular or professional opinion that the excretion of phosphoric acid is perceptibly or decidedly increased by mental labor, the most common form in which the statement is made being in regard to the increased elimination of phosphates by clergymen on Mondays. I have not, however, been able to find the statement distinctly made by the original authority, but find it in the works of one who is known as the most elegant of physiological writers and the most scientific of *littérateurs*, who has assured me that he had authority for his words.

Whether it be based on the statements of Golding-Bird or not I do not know, but if so it does that eminent physiologist much injustice, as he does not speak at all of the elimination of phosphoric acid, but of the deposit of earthy phosphates, and refers to Sunday services not as intellectual labor, but as bodily exertion and anxiety.

The technical difficulties in the way of such an inquiry, if the difference be at all a marked one, are almost none at all,

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\* Read before the American Neurological Association, June 22, 1883.

since the determination of phosphates with reasonable accuracy is a very simple process, but it is not so easy to make the distinction between mental labor and mental rest a very marked one. Some people seem to consider it a credit to themselves to have been engaged in an intellectual occupation, and are apt to put their habitual pursuit high up in the scale.

I had a young girl in the hospital who claimed that she had exhausted her nervous system in her daily avocation, which proved to be the pasting of labels upon shoes.

I hope I have not fallen into a similar error.

We have no accurate scale for mental labor corresponding to the foot pound of mechanical work done, and it is very obvious that degrees of mental exertion are utterly without correspondence to the value of results obtained. A person unapt in mathematics, for instance, may strive for hours and really spend a large amount of cerebral energy in demonstrating to himself a proposition which to another is a mere axiom, demanding no perceptible effort for its comprehension. The feeling of fatigue, the consciousness of mental effort, is perhaps the only means we possess of estimating intellectual labor, and this, it is evident, may as well result from the adding up of the most meaningless column of figures as from the composition of a sonnet. I have been, on this account, more careful in describing in what my supposed mental avocation consisted during the times for which the excretion of phosphates was determined.

I cannot claim for them any high degree of intensity. My lecturing has been upon subjects, with one exception, familiar to me from many years' repetition, my reading of a more or less routine character, searching for references, etc., but not novels. I have always found myself distinctly tired after my lecture, a feeling which I think is not fully accounted for by my standing during its delivery.

On the other hand, periods of supposed intellectual rest

cannot be made absolutely such. It is impossible to make the mind a perfect vacuum.

A certain admixture of bodily and mental labor also is unavoidable, if any thing like speaking or writing is attempted, and I suppose it might be difficult for one to remain wrapped in intense thought with no outward expression, without being at the same time open to a suspicion that he was in a condition of mere revery or dreaming, rather than of intellectual effort. There are few forms of bodily exercise which are unattended by some sort of intellectual activity, except the most monotonous and unvarying of employments, like work in a treadmill, the turning of a crank, or sawing wood, and if the employment demands no reflection, it is impossible to make sure in the case of even the most stolid and impassible drudge that his thoughts are not employed in some other direction.

So that any observations must be made in reference only to greater and less, and not to the presence or absence of intellectual processes, and the person experimented on can tell better than any one else the degree.

My observations on myself have been made during the latter part of the day, as being more under my own control, and because I could on different days make the conditions of mental labor vary more distinctly than during the morning and early afternoon, when it was difficult for me to know what my occupation was going to be, or how much anxiety or perplexity I should have.

The earlier observations embraced only the time of a lecture and a few hours afterward, but as it might be objected that phosphoric acid was formed during the period of greatest mental labor, but only slowly found its way into the blood and out of the excretory organs, I made a few others in which the phosphoric acid was measured not only for the evening, but for the succeeding night.

In some of these the earthy phosphates were separately

estimated, with the result of giving about the ordinary proportion and showing nothing of special interest.

I do not intend to inflict upon the Society all the figures, but merely to state results. Taking the first series of experiments, where the time covered was *about* two hours, including in a part of them an hour of some sort of medical instruction, reducing all to the uniform standard of two hours *exactly*, and dividing into two sets of work-days and leisure-days respectively, we find that the average amount of phosphoric acid excreted in the two sets is the same within three milligrammes, *i. e.*, .247 in the first set and .250 in the second.

Two observations I did not know where to class. One of these was taken from the time when an emergency lecture was given, at an hour different from that of the others, and which might be considered as involving more than the usual amount of exertion on account of the lesser familiarity of the subject. The quantity of urine and of phosphoric acid was in this instance diminished.

The second was from a time occupied in reading and in attending a reception, and I am unable to say whether there was any mental exertion or not.

In the next experiments, extending over a longer time, the excretion of phosphates was distinctly less during the working afternoon and evening and during the succeeding night than during the corresponding times when as little as possible was done.

It will be seen by these figures that, so far from the phosphates being increased in the urine by mental exertion, they have, in some of my experiments, been rather diminished during the process which I dignify by the name of thought.

Would it be fair from these figures to infer that no phosphorus is used up in the process of cerebration? Certainly not; but they are enough to show that the amount of

phosphates derived from the metamorphosis of brain tissue in the condition of physiological activity is so small, in comparison with that from the system generally, that it has no perceptible effect on the total of phosphates found in the urine.

It is as much out of the question to judge of the amount of phosphates sent from the brain by examining the urine, as it would be to tell whether there had been a thunderstorm in Minnesota by measuring the rise of water at the mouth of the Mississippi.

Is there any reason for a *diminished* secretion as found in certain of my experiments? I believe it may be easily found by noticing the lesser amount of urine secreted on these occasions.

In the condition of concentrated attention it is in accordance with all our ideas of physiological activity that the brain should receive a larger supply of blood and, either directly from the withdrawal of this blood from the kidneys, or, as seems to me more probable, from a change in the blood tension, the pressure in the kidneys, and consequently the amount of urine, be diminished.

I have noticed on other not recorded occasions, that the flow of urine after a lecture, or other exercise demanding close attention, has been quite scanty.

The last two experiments, which are fairly comparable to each other, seem to give results opposed to those obtained before. They, however, no more than counterbalance these, as the summing up of all the experiments together in the form of an average of phosphoric acid secreted per hour, shows a difference between work- (.1153) and leisure-hours (.1157) so small, that the coincidence of the two figures must be looked upon, considering the small number of experiments, as almost accidental.

Exp.	Hour.	Amount.	Phos. Acid.	Amount Per Hour.	Phos. Acid Per Hour.	OCCUPATION.
		cc.	GRAMMES	cc.	GRAMMES	
1	3.35 to 5.40	150	.285	72	.137	Did nothing. Slept.
"	10.35	280	.613	57	.125	Convivial supper.
"	7.30 A.M.	310		34		
2	3.30 to 5.37	250	.350	118	.165	Writing and reading. Went to fire. Drank considerable water.
3	3.30 to 5.30	100	.230	50	.115	Slept and did nothing. Drank a glass of alkaline water and two glasses of wine.
4	3.35 to 6.15	270	.445	101	.167	Sleeping and driving.
5	3.40 to 6.05	170	.315	070	.130	Driving. Saw a not difficult case in consultation.
6	7.10 to 11.15	98	.404	24	.099	Emergency lecture from 8 to 9. Reading.
7	3.43 to 5.05	114		83		Recitation.
"	6.35	43	.345	29	.120	
8	3.45 to 5.57	106	.328	48	.149	Clinical conference. Examination of urine. Writing.
9	3.45 to 6.03	123	.258	53	.112	Some reading. Some social entertainment.
10	3.45 to 5.20	36		23		Lecture, walk, dinner.
"	7.00	24	.195	14	.060	
11	3.45 to 9.00	205	.400	39	.076	Had taken ether to have carbuncle opened. Afterward asleep.
"	7.55 A.M.	318	.192	29	.109	Driving. Slept very well.
12	3.45 to 6.10	845				Lecture, writing, etc. Dinner, writing.
"	7.40	778	.986	51	.147	Meeting of Med. Imp. Soc. Writing until 10.25.
"	10.27	177				Read a little poetry and went to bed. Slept well.
"	11.30	30				Last urine half an hour after breakfast
"	6.00	210	.778	42	.076	Doing nothing. Dinner. Drive.
"	8.45	192				Very little reading, and but little conversation. No studying.
13	3.47 to 5.55	138				
"	10.29	366	1.109	75	.165	
"	11.35					
"		26	.837	24	.081	Bed about 12.
"	8.50	346		37		
14	3.30 to 10.30	230	.943	33	.135	Walk. Reading in library. Dinner. Writing and reading until 10.30. Two glasses of water at dinner.
"	8 A.M.	533	.906	56	.095	Pot. brom. and little bicarb. soda at bed-time. Slept well.
15	3.30 to 10.30	218	.861	31	.123	Reading exam. books. Two or three glasses of wine. Dinner. A little carb. soda. Reading exam. books and writing. Very warm day.
	Night	not taken.				
16	3.30 to 10.30	402	.824	57	.1175	Reading exam. books. Dinner.
"	8 A.M.	314	.933	33	.099	A little carb. of soda. Much cooler day.
17	3.30 to 10.30	250	.747	35	.1065	Riding and strolling about. Conversation.
"	8 A.M.	214	.640	22	0.67	Dinner and same again. Cool day.

LEISURE-DAYS.			WORK-DAYS.		
Expts.	Amount.	Phos. Acid in two hours of afternoon.	Expts.	Amount.	Phos. Acid in two hours of afternoon, including lecture, etc.
1	144	.274	2	236	.330
3	100	.230	7	166	.240
4	202	.334	8	96	.298
5	140	.260	10	46	.120
11	78	.152			
	5) 664	1.250		4) 544	.988
	133	.250		136	.247

## AVERAGE ELIMINATION OF PHOSPHORIC ACID PER HOUR.

Hours of work and succeeding.

.1153

Observations.

2, 6, 7, 8, 10, 12, 14, 15, 16,

Leisure.

.1157

Observations.

1, 3, 4, 5, 9, 11, 13, 17.

## THE EARLY SYMPTOMS OF GENERAL PARALYSIS OF THE INSANE.\*

By Dr. W. B. GOLDSMITH,

SUPERINTENDENT OF THE DANVERS LUNATIC HOSPITAL.

AS physician in hospitals for the insane, I have received many cases of general paralysis in which there had been an entire failure to appreciate correctly the, at least, possible import of various symptoms appearing before the unmistakable ones, which failure was sometimes attended with serious injury to the patients or others; for in disorders affecting the organ which controls the individual in his moral obligations, professional duties, social relations, and business transactions, the early recognition even of disease which we are forced to regard as incurable, has more practical importance than exists in disease of other organs, where an early accuracy of diagnosis often simply hastens the "verdict of despair" to the patient without benefiting his fellows; and among the various forms of mental disorder, there is probably none which, in proportion to its frequency, so often before its recognition ruins the laboriously acquired and carefully guarded reputation of a lifetime, or involves relatives in scandal and financial reverses.

This failure of appreciation of early symptoms is probably partly because general paralysis, unlike most other forms of

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\* A paper read at the annual meeting of the Mass. Med. Soc., June 13, 1883.

disease attended with mental decay, does not usually select its victims from those who have inherited weak and unstable nervous organization, but from the capable and vigorous, in whom no one expects weakness to show itself, and partly because certain mental symptoms are so striking, that we are liable to identify them with the disease, and not recognize it without them.

My remarks are based on an analysis of the histories of one hundred cases, and I think that they possess more accuracy as to fact than the average of such histories, because I have taken the cases of such patients only as had been under the careful observation of friends whom I believe to be intelligent and reliable.

This plan is open to the objection that the facts are largely obtained from non-medical and non-expert observers, but this is a source of error that cannot be avoided in studying mental disease, because the earlier symptoms have usually persisted some time before the case comes to the general practitioner, and still longer before it reaches the specialist, and, as subjective examinations as to previous history cannot be considered reliable, the observation of friends is our only resource; and it may be said in favor of the accuracy of my facts, that friends are much more likely to recall slight changes in a retrospect, and to frankly tell the whole truth concerning mental symptoms when they have become sufficiently marked to render it desirable to send the patient to a hospital, than earlier, when they feel anxious to cover up improprieties and weaknesses. It is also true of these cases, that they were selected at a time when the diagnosis was unmistakable, so that, whatever may be said as to the occurrence of similar nervous symptoms in patients who do not become general paretics, it is undoubtedly true that they were in these patients the warnings of that disease, and my aim is, not so much to record

the symptoms after they have become sufficiently characteristic for a certain diagnosis, as to show what are actual danger signals that should render the physician alert and observing ; the recognition and observance of which would, I am sure, prevent much financial loss as well as danger to individuals, and unjust condemnation by legal tribunals and society ; and it is reasonable to suppose that the nearer the beginning we start, the more likely we are to prevent the dire ending which we now regard as inevitable. That these signals will be most varied and inconstant follows from the nature of the disease they indicate, as we must remember that there is no variety of nerve-tissue, in the cerebro-spinal or sympathetic system, which has not been proved to suffer degenerative lesion consequent on this disease, or which has not been claimed, with fair assurance of accuracy, to have been the seat of the initial active lesion of its commencement. Lewis has traced the descending degeneration as far as the sciatic nerve, and Westphal and others have described ascending degeneration from lesions of the spinal cord, traumatic and others, while some recent observers think that some cases at least have the origin ascribed to the disease by MM. Poincaré and Bonnet, who, in 1863, found marked changes in the sympathetic ganglia and considered them primary. As this paper is not designed for those who have given special attention to nervous diseases, I will venture to recall the variety of symptoms likely to be present, and I will enumerate them as nearly as possible in what I believe to be their order of frequency. It is a disease always presenting during its course both motor and mental symptoms, which, however, may vary greatly in their character, intensity, and order of appearance. The motor symptoms are always evidences of diminished muscular power or control, and may affect any muscles, but usually do appear first in those groups whose

functions require the greatest harmony and nicest adjustment in action. Hence the common early motor symptoms are defective articulation, tremor of the tongue, tremor of the facial muscles when expressing emotion, irregular chirography, inability to control the hands in such nice movements as are requisite in playing musical instruments, general tremor, inco-ordination or paretic weakness of gait, and occasionally localized clonic spasms, most frequent in the face. Perhaps, too, the seizures which occur sometimes during the history of most cases may best be included with the motor symptoms. These may occur at any time, and may simulate petit mal, grand mal, apoplexy, or have a mixed character rather peculiarly their own.

Of sensory symptoms there may be dysæsthesia, hyperæsthesia, anæsthesia; and, exceptionally, almost any variety of neuralgia.

My experience leads me to regard disorder of the special senses as a rare early symptom and not very frequent later one, but both impaired function and hallucinations of all are reported.

To the sympathetic system probably may properly be charged most of the pupillary changes, which are: inequality, usually shown most strikingly by the failure of one pupil to dilate as readily as the other in moderate light; a marked decrease in the size of both, making sometimes the pin-hole pupil, and sluggishness in action in varying light, in accommodation, and in answer to sensory stimuli. To the vaso-motor control of the sympathetic must also, I think, be ascribed the irregularities in the superficial circulation frequently shown by localized or general flushings, resembling that seen in one accustomed to alcoholics when slightly under their influence. There are other symptoms which cannot well be classified pathologically, but which possess some value for diagnostic purposes; as the condition

of the tendon reflex, which may be not noticeably changed, increased, or absent.

Similar changes of increase or diminution may occur in the skin, cremasteric and sphincter reflexes, but are not often seen until later in the disease.

All known mental symptoms are found with greater or less frequency, those usually considered characteristic being a marked feeling of self-complacency and content, and delusions of wealth, greatness, and power.

Eighty-seven of my one hundred cases were men and thirteen women, but I have not considered them separately except as regards some mental symptoms which seem modified by sex.

The frequency with which each of the various physical symptoms mentioned appeared as the first physical change is as follows:

Some defect of articulation thirty-eight times. The text-books often attempt to enumerate various kinds of articulatory defect that occur in general paralysis, but any such classification is rather incomplete and misleading, as any part of the articulatory apparatus may be chiefly affected and all kinds of disorder occasioned thereby. A hesitancy of speech, recognized best when the patient is quietly conversing, and an occasional elision of a syllable, best recognized when the patient is earnestly conversing, are probably most frequent.

Some form of seizure appeared first twenty times. Thirteen of these seizures resembled closely the convulsions of grand mal, the patient falling to the ground and being generally convulsed, but none of them are known to have given the epileptic cry, and the succeeding coma or stupor was much more pronounced and prolonged than in ordinary epilepsy. Four of this thirteen were sent to the hospital diagnosed simply as cases of epilepsy.

Four of the seizures resembled petit mal, the patients losing consciousness, but having no noticeable convulsion. And three were considered apoplectic attacks, and resembled apoplexy in that the patient fell and remained completely or partially comatose for a time, with little or no convulsive movement. My cases indicate that seizures should have greater prominence as early symptoms than is given them by most authors, but I am unable to say whether they are exceptional in this respect or not.

Tremor of the lips and face was noticed first eight times.

Inco-ordination of gait, ten times.

Diminished sexual power, six times.

General tremor, six times.

Cutaneous numbness and tingling, three times.

Changed chirography, two times.

Dilatation of superficial capillaries and sensation of heat, once.

Dilatation of superficial capillaries and marked hyperidrosis, once (I have seen this same marked hyperidrosis in one other case as a later symptom).

Localized cutaneous hyperæsthesia, once.

General cutaneous hyperæsthesia, once.

Ptoxis, external strabismus, and diplopia, once in a syphilitic case.

Diplopia alone, once in a syphilitic case.

Failure of sight from atrophy of the optic nerve, once in a syphilitic case.

Nine of these patients also suffered from decided pain and discomfort in the head previous to other symptoms—it being sufficiently marked in four cases to excite suspicion of brain disease.

There are some other symptoms which may have appeared early and escaped notice, as they are of a character not likely to attract the attention of the non-medical

observer, and I can only give their relative frequency at the time the patients were admitted to the hospital, which was at varying stages of the disease. Thus the patellar-tendon reflex appeared normal in forty-six cases; markedly supra-normal in twenty-four cases; very marked but not necessarily supra-normal in fourteen; very slight but not necessarily below normal in twelve; absent in four.

The number of cases in which it was found supra-normal is comparatively greater, and the number in which it was found slight or absent less, than in those observed by Mickle in England and Westphal in Germany, but corresponds pretty closely with Shaw's observation in this country.

My whole experience, which extends over a larger number of cases than the one hundred mentioned, agrees with the ratios of their figures as to patellar-tendon reflex, and my estimate of its usefulness in diagnosis is as follows: The absence of change does not render the disease improbable.

Well-marked exaggeration in both legs is strong *corroborative* evidence of general paralysis. Diminution or absence of it is decidedly less so, but still has some value.

There has always been disordered gait in the cases where I have seen it absent, and, I have no doubt, tabetic lesion of the cord.

I carefully observed the length of duration of the disease at the time when the examination of the knee jerk was made, but there was no indication of a connection of particular conditions with different stages.

On admission the size of the pupils was unequal in sixteen of my cases, the right being larger in ten, and the left in six. Both pupils were abnormally small in six cases, and both dilated in four. None of these changes seemed more frequent at one stage of the disease than at another.

These figures indicate that inequality of the pupils is not very common, and my own opinion, based on the examina-

tion of other cases, in addition to these, is that its diagnostic importance is usually overrated by the text-books, as its absence has no significance and its presence may be the result of several causes other than general paralysis.

The mental change which appeared first most frequently was failure of capacity. This was true of thirty-six cases, it being chiefly noticeable in nineteen, because of impaired power of memory, and I will venture to remind you that, as this failure is most frequently due to lessened power of attention, the examination should not be concerning events occurring long ago when there was presumably mental integrity, but concerning trivial matters of recent occurrence. Dr. Holmes makes his old man testily refute this imputation of failing memory by saying: "I remember my great-grandma! She's been dead these sixty years."

And many a general paralytic can give you an accurate history of the events of his previous life long past, when he is unable to tell you where he dined day before yesterday. It is also true that the memory will occasionally assist the patient to conceal failure of reasoning power, as in the case mentioned by Mendel, where the patient answered readily and correctly, that twelve times twelve is 144, but made twelve times thirteen a less number.

In eleven cases the mental failure was evinced by poor judgment in business, without manifest change in activity or habits of life, and in six cases this entailed serious financial reverses on the patient and his family.

In the remaining six cases of mental failure it appeared simply in mental sluggishness, great and unaccustomed disinclination for mental or physical exertion, accompanied in three cases by a striking tendency to sleep.

Marked depression without obvious delusion was noticed first twenty-two times. Marked exhilaration and self satisfaction, seventeen times. This was accompanied by erotism

in nine cases, two of them attempting rape, two indecent familiarities and exposure, and three began an unusual and scandalous course of licentiousness. Several others of this class, before abstemious, became addicted to alcoholic excesses, and attention was attracted to two by thefts which were undoubtedly the outcome of the disease, though not so recognized until the courts had taken action in both cases and one of the men was in prison.

Insane delusions were noticed first twenty-five times. They were the characteristic ones of wealth and greatness in twelve cases.

Six showed a variety of delusions of persecution ; six believed their wives unfaithful, probably chiefly because their erotic desires met repulse, and were dangerous to them thereby ; and one had general delusions, based on hallucinations of hearing.

Maniacal excitement, of extreme intensity, sometimes appeared very rarely in fifteen cases, but was not the first symptom noticed.

The thirteen women exhibited no marked variation from the men in physical symptoms, but the mental symptoms were commonly much less pronounced and active.

Six showed simple dementia. Three had definite delusions that men outraged them ; and two, delusion that some spirit or angel had sexual intercourse with them.

Two had ordinary delusions of persecution. Several of those who had delusions of being outraged thought themselves pregnant, and this is by some observers considered a frequent delusion among female general paralytics. I think that the delusions as to sexual intercourse usually depend on the misinterpretation of an orgasm, experienced at night ; and those of pregnancy, indirectly on the same, or on anomalous sensations in the abdomen.

Three of these women were of very good social position,

and this is a larger proportion than is found abroad, where general paralysis is considered very rare among those having the social rank of ladies.

The relative time of appearance of the two classes of symptoms was as follows : In sixty-eight cases the mental and motor symptoms were noticed at the same time.

In twenty-four, mental symptoms alone first attracted attention ; and in eight, the motor symptoms.

These figures are undoubtedly inaccurate, as slight changes, particularly of a motor character, might readily escape the notice of a non-expert observer, and some motor changes would unquestionably have been observed by an expert in many of the twenty-four cases which are recorded as presenting mental symptoms alone at first, but they do show that much difference of time between the appearance of these two classes of symptoms is exceptional, though it is true that either may show remissions or intermissions early in the disease, so that their existence can only be learned by careful questioning as to the previous history. Thus, one may see a patient laboring under intense maniacal excitement, in whom no motor paresis can be detected, but who has a history of previous convulsive seizures, or attacks of unconsciousness, which change the diagnosis from curable mania to general paralysis. In one of my cases, a woman, marked defect of articulation was for some time regularly present each morning, but disappeared before noon, and it is not at all uncommon to see pronounced symptoms of any kind diminish greatly or disappear, if the patient is changed from excitement and dissipation to a quiet routine of life.

In the few cases where mental symptoms appeared to me to unquestionably precede the physical, they were almost invariably those of marked depression not reaching the grade of positive insanity, and the physical symptom that appeared alone first most frequently was some form of seizure.

Finally, the symptoms presented by these cases appear to me to indicate, with the somewhat moderate weight of authority to which their numbers entitle them :

1st. That the striking and characteristic group of symptoms ascribed to the disease by Calmeil in 1826, and having greatest prominence in most text-books since, is to be found only exceptionally in the cases of to-day at the time when the diagnosis is most important.

2d. That physical and mental symptoms usually appear nearly synchronously, so that the physician has the presence or history of both to aid him when called upon for a diagnosis, and it is probable that most of those who report cases of general paralysis without mental impairment are not sufficiently expert to recognize a moderate degree of dementia.

3d. That their observations agree with those of most writers in making defective articulation the most frequent and characteristic early motor symptom.

4th. That changes in the pupils and disorders of gait are less frequent and have less value in diagnosis than is usually ascribed to them, and that given pupillary changes are no more frequent in one stage of the disease than in another.

5th. That the patellar-tendon reflex is found markedly supra-normal in nearly twenty-five per cent. of general paralytics, and that the presence of this symptom is of strong corroborative value in diagnosis, though its absence has none, and that no peculiar condition of the patellar-tendon reflex can be associated with any given stage of the disease.

6th. That hallucination or impaired function of the special senses is very rare as an early symptom ; hallucination (auditory) having been noticed first in but one case, and impaired vision but once in a syphilitic case. The

diminution in the sense of smell, which Voisin thinks very frequent in the early stages, was not noticed in any of my cases, though it may have been present and escaped attention in some, as slight failure is difficult to recognize.

7th. That it is of great importance in the case of a patient showing mental symptom to inquire carefully for a history of convulsions or loss of consciousness, as these were the first motor symptom in twenty of my cases.

8th. That among mental symptoms the marked exhilaration, with delusions of wealth and greatness, which is usually considered the characteristic mental symptom, is present early in less than one fourth of the cases, and that simple failure of mental capacity and activity, and mental depression are the more frequent first mental changes.

## EDITORIAL DEPARTMENT.

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AN ADDRESS DELIVERED AT THE COMMENCEMENT OF  
THE WOMAN'S MEDICAL COLLEGE, OF THE N. Y.  
INFIRMARY, MAY 30, 1883.

LADIES OF THE GRADUATING CLASS :—When you first honored me with an invitation, I declined, and for a reason well known to you. I think it extremely difficult to find a theme that shall be interesting at once to medical students, and to these assembled friends, who, though much interested in certain students, can be expected to take but little interest in medicine.

Were the devising of graduation exercises entrusted to me, I should not hesitate to borrow from the ceremonies of the antique Eleusinian mysteries, or from those of the mediæval Rosicrucians. For however much the light of common day and of common-sense may have been let in upon the art of medicine, it still remains a mystery, a sacred mystery, to the uninitiated ; that is, to all who have not been submitted to a prescribed discipline.

If, however, I should seek a ceremonial of graduation appropriate, not to the mysterious and difficult nature of the studies you have pursued, but to the arduous personal responsibilities you are about to assume, I might find it in the vigils prescribed to the candidates for knighthood in the Middle Ages. These were required to spend a night in fasting and prayer in a solitary chapel, watching the armor and the scabbarded sword they had not yet been permitted to unsheath. There are so many spiritual resemblances between the duties of an energetic physician and those of a well-armed knight.

“ Bound for the wide world past the river,  
There to put away all wrong,”—

that we would not be far amiss if we imitated these solemn vigils of his initiation. And were we habituated to the accurate symbolism of a more imaginative age than our own, we should at least take care that the garlands which were offered to you in congratulation, were composed, not of roses, but of thorns. For it is thorns, and not roses, which fitly symbolize the career upon which you have now chosen to enter.

No symbolic or mysterious ritual, however, is likely to be either revived or invented for the graduation of students in medical schools in modern New York. There is, however, a widespread feeling among the Faculty of this School, that the exercises of graduation should be exclusively medical in character; that the examinations should be entirely, or in part, conducted in public, before a medical audience competent to judge of their excellence; that the students should defend their theses; should give evidence of practical conversance with the duties of their profession, by examinations at the bedside of patients. The graduating exercises, in a word, should all be performed by the graduates, and not before them, by some one else. Thus only could they acquire real significance and importance. Thus only, I may add, could they be affiliated to the customs of the great European universities, which, in this, as in other matters, must remain our permanent models. These considerations carry so much weight, that I am happy to believe it not impossible that this *may* be the last public commencement, in the popular sense, ever held by our School. In that case, it would be the last occasion on which the graduates and their non-medical friends could consider together some of the non-medical aspects of their professional career.

Now, in this connection, the topic which most frequently suggests itself at our graduation exercises, is that of the sex of the graduates. Indeed, you are liable to be so much and so frequently reminded that you are women physicians, that you are almost liable to forget that you are, first of all, physicians.

As a rule, I have always advised you to reverse this order; to so saturate and permeate your consciousness with the feeling for medicine, that you would entirely forget that public opinion continued to assign you to a special and, on the whole, inferior class of workers in medicine. Still more have I advised you to forget that, in attempting to become physicians at all, you and—far more than you—your predecessors, have in any way braved public opinion. If it be a new place into which you have entered, it is incumbent upon you to acclimate yourselves as quickly and thoroughly as possible to its atmosphere, and not keep dawdling on the threshold to forever remind yourselves and every one else that you have only just come in. Recently emancipated people are always bores, until they themselves have forgotten all about their emancipation. But those, whose souls are really born free, easily regard the trammels imposed upon them by convention or circumstance as trifling accidents which must necessarily be set aside. They do not dream of glorifying themselves because a barrier has fallen down; if the barrier be an injustice, they know that sooner or later it must fall, and once out of their way they spend no further thought upon it.

There is certainly enough, and far more than enough, in medicine to interest and absorb you, without diverting your attention to questions of your social status, and if you do not find the facts of medicine more interesting than any other facts, you are not fit to be physicians. There are, however, occasions on which it is proper to consider the fact that you still constitute, to a considerable extent, a class. You have, therefore, a certain class of interests, and it is important that you should neither overlook these, nor belittle their real importance. For if medicine, or rather, biological studies in health and disease, be to us the most interesting of all subjects, we must admit that after this, the overthrow of social prejudices, tyrannies, and monopolies is, perhaps, the next most interesting theme that could engage the attention of any one. And of all monopolies, what has ever been more odious than that which has restricted to one half of the human race the advantages of education and the facilities of increased

life which that confers, while the other half of humanity has been forcibly excluded from both?

It is true that this monopoly, like all other class monopolies which ever existed, could be defended at first as a simple expression of a natural order of things, and afterward by all the force of the association of ideas which this original order engendered. Yet there never was a time when the monopoly was not self-contradictory and injurious. There was no business reason why women should not have been educated in ancient Athens, for there, education was only designed for refining social intercourse. But, as every one knows, the more respectable and high-toned the woman, the less was she allowed to be taught. There was no family reason why the celibate nuns of the Middle Ages should not have shared in the early movement toward learning which began in the monasteries; but it is certain that they were not so allowed. There is no economic reason why in modern England, with its thronged population of unmarried women dependent on their own exertions, the slightest opposition should have been offered to the opening of a new profession to women as a means of livelihood. But in no part of the civilized world, not even in America, has opposition to women students and practitioners of medicine, been so bitter, so brutal, so densely organized, so versatile in its resources, so multiple in its hypocrisy, as in England.

The more we reflect upon this opposition, the more incomprehensible does it appear. Let it be admitted that, for one reason or another, the mass of women had shown, or rather had appeared to have shown, indifference to learning and to the higher forms of work. Should we not have supposed that every class in the community would have hailed with the liveliest satisfaction the first manifestation of such interest on the part of women? Granted that facts seemed to justify, at least a provisional scepticism, in regard to the ability of women to profit by a professional education in abstruse subjects, why should any one have hesitated to offer the fullest opportunities for the development of their powers and the decision of their individual capacity?

The mass of argument, sarcasm, ridicule, invective, and downright calumny which has been poured out upon the heads of the women who, for the last thirty years, have been trying to study medicine, can only be explained by the constant tendency of all monopolies to strengthen themselves by injustice, as soon as they feel that their exclusive privileges are menaced. The argument most frequently brought to the front is, that the presence of women must lower the prestige of any institution to which they were admitted as co-workers or fellow-students with men. When the London University was debating the question of opening its degrees to women, the medical journals received many letters from former graduates of its medical school, solemnly protesting that such an admission would be a violation of their vested rights,—since it must necessarily lower the value of their diplomas long ago earned and paid for. The same considerations have dominated the action of the Harvard Medical School in this country. In this city a few weeks ago, when a young lady physician had successfully passed a competitive examination for position as interne in one of our hospitals, one of the examiners remarked that he should be opposed to her admission for this reason : there would be no difficulty so long as she held the junior position ; but when, in ordinary course of promotion, she should advance to the higher grades, it was to be feared that new candidates of value would not present themselves for the ensuing vacancy, when they heard that, if successful, they must serve under a woman as a superior officer. Now it happened that at the last examination which had been held at this hospital, the results were so unsatisfactory that all the candidates were rejected. Had this happened after the nomination of the lady in question, —for she was appointed,—how easy it would have been to infer that it was her presence in the hospital which had deterred suitable candidates from presenting themselves !

There have been but three other occasions on which women have attempted to compete for positions in New York hospitals. On the first, the candidate passed a successful examination, and was admitted without further ado. On the second occasion,

when a vacancy was open at Charity Hospital, the woman candidate was acknowledged to have beaten her competitors, but was then refused the place for which she had worked so hard. On the third occasion, a young lady attempted to come up for an examination which was announced for vacancies in the staff of assistants at the female insane asylum at Blackwell's Island. The Commissioners of Charities promised that she should be considered eligible; but one of the medical examiners deliberately misinformed her as to the date of the examination, so that she could not present herself. The resident superintendent, temporarily in charge, further declared that he should in any case decline to be governed by the results of a competitive examination; that he should appoint whom he chose, and he certainly should not choose a woman.

Now Dr. Tuke, the famous English alienist, who has been studying the organization of insane asylums all over the United States, has expressly declared that the best conditions were invariably found where the female patients of the asylum were under the charge of a resident female physician. Similar testimony comes from every asylum where women physicians have been installed. Nowhere is it more desirable that they should obtain a footing than in the vast bedlams of our city almshouses for the pauper insane. But because a handful of persons in charge happen to dislike what they consider an innovation, all attempts to secure competent female assistants on the islands have so far failed.

Hospitals, as well as universities, belong, of right, to the communities which support them. Nothing can be more absurd than the assumption, almost universally made, that either the trustees who administer such public institutions or, in the case of hospitals, the physicians who visit in them, have the right to monopolize their privileges to the exclusion of any duly qualified citizens. In regard to universities and professional schools, it is well known that this assumption is far from being tacit. Applications for admission have been made by women over and over again, and refused as calmly as if these public institutions were

pieces of private property, upon which intrusion was an impertinence. In regard to hospitals, the question has been much less sharply defined, because as yet few candidates have presented themselves. Few women have had the courage to undergo a long and expensive preparation for an examination, to which, after all, they might at last be pronounced ineligible. No woman has even ventured to apply for a position in the Woman's Hospital, where, if anywhere, it might be presumed that a woman physician should be entitled to a place. It has been stated, I know not on what authority, that in this particular hospital the Board of Lady Managers would peremptorily oppose the admission of women internes, even if they had conquered their place by competitive examination, and had overcome the prejudices of the medical staff. It is very certain that not a member of this Board has ever taken the slightest step toward securing the services of a physician of their own sex for the women under their care, nor toward throwing open the advantages of this hospital to the women physicians who might worthily profit by them.

This practical monopoly of the vast clinical opportunities contained in the hospitals, dispensaries, and city institutions of New York, cannot, however, be made a matter of serious complaint until competent women candidates shall have come forward in greater numbers and with more determination to demand their share of this public property. When the demand is once made, it cannot but make itself heard. When at least half of the hospital population are women, and sometimes a third are children; when female nurses are being trained in large and increasing numbers within the hospital wards, it is absurd to allege that from motives of either delicacy or convenience, female physicians must be excluded. If, in certain hospitals, the existing arrangements are such that a woman interne could not perform all the duties, then the existing arrangements should be modified whenever a woman candidate shall have demonstrated her intrinsic fitness for the place at a competitive examination. There is no good reason why, in such a case, the female wards of the hospital

should not be assigned to the woman interne, the male wards to her masculine coadjutor.

The appointment of women on the staff of visiting physicians to a general hospital is a question that has not yet come up.

This subject of hospital appointments well illustrates the close solidarity of interests which exists between women physicians. It will not do for you to forget this, and to imagine that when you have once secured your several diplomas all your class work ends. It will not do to imagine that devotion to your own individual interests and advancement will suffice to secure even that. You must combine to remove the difficulties which stand in your way as a class, and to which the fortunes of any individual among you are always liable to succumb. The habitual exclusion of women from fit opportunities for preparation or exertion, engenders an habitually low tone of confidence in their abilities, which constantly interferes to prevent any given woman from demonstrating her abilities. We have not yet reached the time when it will be considered as natural for a family to employ a woman physician as a man ; or where the profession of medicine will be as evenly distributed between men and women as is now the profession of teaching. To bring about this state of things requires much effort, individual and collective, persistent, patient, far-sighted, indomitable. The problem involves questions of rights, but is by no means only a question of rights. An inequality must be rectified, and in the teeth of much opposition ; but the most delicate part of the task consists in actually raising to an equality the class which hitherto has been really inferior.

You may contribute to this great work in two ways. In the first place, you should be continually exerting yourselves to increase the educational advantages of the school of which you are alumnæ, and also to extend the opportunities for undergraduate education elsewhere. It is strange how little our graduates have hitherto exerted themselves in this respect. The seventy-five whom we have by this time sent forth from among us, could, if solidly united in purpose, immensely increase the

educational facilities of those who come after them. But it is a short-sighted policy to imagine that the affairs of the school no longer concern you because you will never be obliged to re-enter its undergraduate course. On the contrary, who is to look after them if not you? Why should outsiders, from motives of pure philanthropy, busy themselves with collecting support for institutions and enterprises which should by this time be managed by the collective efforts of the college graduates? There is another kind of educational effort which it is most important for you to make: I mean the continued education of yourselves. It is a commonplace of commencement addresses to remind you that your education is only just begun; that you must continue to study and improve, and so on. I am not speaking however in this general sense, but with reference to a certain peculiarity whose importance has probably not yet impressed you. This is, the remarkable contrast apt to be shown between the energy which women will manifest in obeying authoritative orders for study, and the lack of energy they show in independent initiative. Experience in medical, as in other tuition, has abundantly proved that in every class there is always a fair proportion perfectly capable of learning all that can be taught them. When such students are found insufficiently prepared on any subject, we may justly lay the blame to some defect in the method of teaching. And at present, the method in vogue of teaching the medical sciences is so defective that it is not surprising so many students remain so far below their real capacity of attainment. But under whatever guidance a student is instructed, there comes a time in which he must become his own guide; in which further knowledge must be obtained in obedience to his own consciousness of its interest and necessity; in which further discipline must be self-imposed. And it is precisely here that women students are apt to fail, to stand still, to abandon all definite intellectual purpose, and begin to drift like rudderless ships. When we consider the often enormous efforts and sacrifices made by women to secure opportunities for study and to work their way toward a diploma, it is nothing less than astounding to

notice the intellectual apathy into which so many sink, as soon as the coveted parchment is secured.

Comment on this circumstance may perhaps be deemed inappropriate on this occasion, and a discouraging endorsement of a widespread reproach that has long enough been made to women :

"Yea," said Cyril : "they learn the old things as well as we. But when did women ever yet invent ? "

I have, however, a word to add in at least partial explanation. Lack of intellectual initiative is by no means confined to women ; it is, in fact, the average condition of the human race. Few, and far between, are the minds sufficiently vitalized, self-reliant, and self-poised, to be able to disengage themselves from hand-to-mouth, every-day necessities and preoccupations, and to pursue an ideal inquiry for its own sake, or for the solitary pleasure of rounding off and completing their stock of knowledge on any given subject. The great mass of intellectual work that is done in the world, is still done in obedience to order ; more remote, less direct than that which lays down the curriculum for undergraduate studies, but still an order which emanates from some superior mind, or from the collective intellectual force of the community. This work is being incessantly stimulated by a complex machinery of societies, publications, prizes, places, reputations, innumerable rewards of most varying character, but all consciously or unconsciously directed toward fostering the mental activity of those who would not work without them.

Now, to the extent to which women continue to isolate themselves, or to submit to enforced isolation from this vast current of intellectual life, it is inevitable that their own must become apathetic. All impulse to energy finally comes from without, as all life depends upon the sun. Before, therefore, much stress can be laid on the reproach of lack of initiative in women, it behooves us to consider whether the position in which they now are is one in which mental initiative has ever been developed on a large scale among men. Their position is colonial ; and every one knows the singular combination of mental inactivity with intense practical energy, which peculiarly characterizes colonial life.

The disingenuous hostility to women physicians, which has marked every step in our thirty years' struggle,—we may justly call it a Thirty Years' War,—has much abated in regard to the elementary question, whether women should receive legal authority to attend such sick persons as chose to consult them. Fortunately for us, the habit of consulting with reputable women practitioners has been established, some time before the present concession to consultations with homœopaths could have robbed consultations with women of all significance. But the effort to exclude women from the full privileges of the profession still continues ; is manifested in such struggles as that which convulsed the Massachusetts Medical Society at its centennial ; in such resolutions as that which excluded women from the International Congress at London ; in the annual debates over their admission to the British Medical Association ; and in the discussions, of various degrees of acrimony, which are excited by the application of a woman candidate to any medical society where a woman has not yet been admitted.

To overcome all this opposition it is necessary not only to make persistent application to these same societies, but to engage resolutely, and without the aid of their stimulus, in the same work in which they are engaged. Our English colleague, Dr. Frances Hoggan, has always been excluded from the Pathological Society of London. But the original work in histological investigation that she has pursued with her husband in their laboratory at home, has received deserved recognition in the leading journals of France, Germany, and even England. It is the old story of the bricks, to be made without straw ; of the shield to be hammered by the Antwerp artificer, without tools. The task is difficult, extremely difficult, but it is by no means impossible. The important thing is to recognize the necessity for constant definite mental work in definite directions ; and the conditions under which this can be performed. This may not always seem to have any bearing on the practical work you may be at the time engaged in. But you may be very sure that if you attempt nothing but what seems at the time absolutely necessary, you will

always remain woefully below the measure of the needful. In intellectual life it is not altogether a paradox to say, "Give us the luxuries, and we will dispense with the necessities."

Evidence of a free, self-sustained, self-reliant intellectual activity is justly demanded as proof that a physician is capable of exercising the independent judgment which is absolutely necessary for the handling of the simplest case of disease. You cannot treat the sick by means of folios of precepts, the most precise and accurate that were ever devised. And to be able to modify the precepts which you have been taught as a basis for your self-instruction, your minds must have been trained to inquiry, to independent pursuit of knowledge, to the grouping of facts, to the summing of evidence, to the original observation and suggestion which a free mind pursues as its natural and inevitable occupation. Do not, therefore, continue to justify the old assertion that the only free choice a woman ever really cares to exercise is that of choosing her own master. If you cannot learn to act without masters, you evidently will never become the real equals of those who do.

What a number of distinct and different views of things you must therefore hold steadily before you ! You must, on the one hand, forget that any social prejudices stand in your way as physicians : but on the other hand you must remember that, in virtue of these, you continue to have certain class interests, which cannot, with either justice or safety, be ignored. You must remember all that you have been taught ; and yet you must soon cease to think of what you have been taught in comparison with what you must freshly learn. At certain times you must be able to sink all immediate practical considerations in the interest of pure ideas. Yet, to the pursuit of these, you must bring a tenacious, practical energy, such as can scarcely be acquired except in conflict with practical emergencies. There is not a detail of your career, theoretical or practical, individual or social, that will not require the highest possible development of your powers of will. This is, indeed, the sovereign power of human nature, without which bright perceptions, good intentions, quick intuitions, flash

only for a moment to vanish in darkness. The beautiful paraphrase of the English poet does not inaptly render the Bible parable :

“ Oh, well for him whose will is strong !  
He suffers, but he will not suffer long ;  
He suffers, but he cannot suffer wrong.  
For him nor moves the loud world's random mock,  
Nor all calamity's hugest waves confound,  
Who seems a promontory of rock,  
That, compassed round with turbulent sound,  
In middle ocean meets the surging shock,  
Tempest-buffed, citadel-crowned.”

M. PUTNAM JACOBI, M.D.

## NEW BOOKS AND INSTRUMENTS.

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**The Diseases of the Liver, with and without Jaundice, with the Special Application of Physiological Chemistry to their Diagnosis and Treatment.** BY GEORGE HARLEY, M.D., F.R.S., Fellow of the Royal College of Physicians, Corresponding Member of the Academy of Sciences of Bavaria, Professor in University College, London, etc., etc.

Illustrated by colored plates and wood-engravings. Phila.: P. Blakiston, Son, & Co., 1883.

Did all medical works have the same reason for existing as the work which it is our privilege to pass in review here, only those that would do honor to their authors and credit to science would ask our attention, and the profession would cease to be burdened with a literature in which the authors attempt prematurely what should be left for the termination of their career—the instruction of the medical public. The entire profession has for many years been under obligations to the unceasing and admirable contributions to our scientific knowledge, of which Dr. Harley has been the author. When this authority appears before his audience with a volume of such size, we have reason in advance to expect much. That a careful study of the book should give ample realization to our anticipations, is naturally to be expected. But the book does more than this, it marks for English-speaking authors the epoch which is now about dawning, of the influence which physiological chemistry is to wield upon the future of not only scientific but also of practical medicine.

To some of our readers this latter remark may seem unnecessary, but we feel certain that many among the busy practitioners look upon physiological chemistry as among the theoretical studies; which, it is true, they admit, adds to the scientific attainments of the possessor of such knowledge, but by no means to his ability

to practise the healing art. No error can be more serious. The proper examination of a specimen of urine for albumen requires more care and knowledge than the simple indiscriminate use of nitric acid and heat. And he who continues in this latter procedure fails in arriving at the proper answers necessary to diagnosis in his case.

Dr. Harley in his preface says :

"I may further add, that, as the object of all theory, and the aim of all science, is to insure wise practice, I desire to call special attention to that portion of the work devoted to the physiological chemistry of the excretions, feeling, as I do, that we are entering upon the threshold of an important line of medical inquiry, which, sooner or later, will be followed by valuable practical results. I would also direct the special attention of my readers to the chapter devoted to treatment, as well as that at the end of the book, entitled, Hints on Diagnosis, being sanguine enough to imagine that the adoption of the principles enunciated, regarding the physical and chemical methods of diagnosing diseases of the liver as well as of the modes of action and administration of the remedies usually employed in hepatic affections, may conduce to a more rational and successful method of treating them than has hitherto been employed. I even go so far as to hope that the result of the diagnosis and treatment, as shown in many of the cases cited, will not only justify the adoption of the principles on which they are founded, but also prove a strong incentive to others to follow the physiological-chemical line of investigation I have striven to inculcate."

Further on in his introduction the author again pointedly says : "How long, I ask, are we to find diseases of the liver, even gravely published by otherwise well-educated medical men, as 'cases of functional derangement,' as if they really believed that functional derangement was itself a morbid state, instead of being, as it actually is, a mere symptom of a morbid physical condition of some tangible part or another of the hepatic organ,—its secreting cells, its ducts, its blood-vessels, or nerves? Have medical men, as a class, yet to learn that nothing in nature happens without a cause ; that no symptom or sign ever originates spontaneously ; that every change in function, no matter however trifling it may be, is invariably preceded by a change in the material organization of some part or other of the tissues inducing it, although we are not always able to detect it?"

The work begins with a chapter devoted to the chemistry, an-

atomy, and the physiology of the liver. The physical examination is given at more than usual length, and some excellent advice included. The author accepts the generally accepted view of the sugar-forming function of the liver, differing from the more recently expressed view of Pavy, that the liver is a sugar-assimilating, and not a sugar-forming organ. He also lays stress upon the fact that the bile acts principally upon the fatty acids, and less or not at all upon the neutral fats.

Next, the author devotes himself to the etiology of jaundice, giving to its consideration a separate chapter. After alluding to it as only a symptom, the author makes his apologies for devoting so much attention to it, by stating that from its ready recognition it is itself so often accepted as the diagnosis, that a few moments' attention to its etiology will serve to show the difficulties to be encountered in arriving at a proper conclusion as to its significance.

Further on in the work, when the same subject is again taken up, we find the author calling attention to the two great causes of jaundice,—the one obstruction, the other suppression, of the biliary secretion. The author, with ample clinical evidence, shows that jaundice which may at first be obstructive, may, when long continued, belong to the other variety,—that from suppression of the secretion. It is in cases like these that the bile-ducts and passages and gall-bladder are found filled, with pale, whitish, inspissated mucus, which is the simple secretion from the mucous walls.

The succeeding chapter, devoted to the signs and symptoms of jaundice, is intended to call attention to the spurious cases of jaundice, and their diagnostic symptoms. In the concluding lines of the chapter we find the statement: "The crucial test for all spurious forms of jaundice is a very simple one, namely, a naked-eye inspection of the fæces. If the stools be pipe-clay colored, the case may be at once put down as one of jaundice. Dark-colored stools do not negative the idea necessarily, because the presence of blood or medicines may produce the black color. If these two causes for darkening of the fæces can be excluded, then a conclusion is justifiable."

The general treatment of hepatic disorders next claims the author's attention. The statements upon the subject of drugs, upon the kinds of food, upon the nature of the drinks, are terse, pungent, and given with a clearness that proves the author to have no hesitation in recommending what his own valued experience

has shown to be fraught with undoubted good results. In no work could a more readable and satisfactory chapter be met upon the subject of treatment of a disease.

Following this the remaining pages, to quote from the work, are devoted :

"1. To the consideration of all hepatic derangements attended with a yellow discoloration of the skin, due to a temporary or a permanent suppression of the biliary secretion.

"2. To the consideration of hepatic diseases equally associated with yellow skin, but in which the discoloration is due, not to a suppression of secretion, but to an obstruction of the biliary excretion.

"3. To the consideration of hepatic affections with which a yellow skin is neither necessarily nor even so much as usually associated.

"4. To the consideration of hepatic ascites.

"5. To the diagnosis, pathology, and treatment of diseases of the gall-bladder.

"Finally to hints in differential diagnosis and prognosis."

Under the generic heading of biliousness, we find a consideration of three forms—the acute, the subacute, and the chronic biliousness. The differing symptoms of the three forms are succinctly given, as is also the treatment.

Under the heading Intra-uterine, Congenital, and Hereditary Jaundice, the author attacks the variety heretofore called *Icterus Neonatorum*, demonstrating that in most cases it lacks all the other symptoms of true jaundice except a change in the color of the skin, and that this change is nothing more nor less than a condition dependent upon an impoverished blood state, and should be called by the name he proposes, "*Chlorosis Neonatorum*." In the previous chapter on the etiology of jaundice, the author has adverted to the fact that, in jaundice from obstruction we have biliverdine circulating in the blood and deposited in the rete of the skin. Now, when devoting himself particularly to jaundice from suppression, he includes all the diseases that produce it under three perfectly distinct classes :

A. Those arising from enervation.

B. Those arising from disordered hepatic circulation.

C. Those arising from absence of secreting substance.

In the subsequent chapters the author pays his respects to the influence of the germs in connection with the subject of epidemic jaundice. We are reminded, or perhaps rather told anew, that

intermittent hæmaturia may, at times, be what it should be designated, a paroxysmal congestive hepatic hæmaturia. In these cases, the author states, the urine, though highly albuminous, usually differs by having a higher specific gravity than in renal albuminuria.

Upon the subject of acute atrophy, the author asserts it to be a mere sporadic form of the contagious jaundice of the tropics; a view in which the author agrees with more recent German writers.

Under the heading of treatment I gladly quote the following, which will serve to remove incorrect impressions left upon the minds of many students by some teachers in medicine:

"At one time it was generally believed that all cases of acute atrophy of the liver were necessarily fatal. Fortunately this is not the case, for in some the violent symptoms gradually disappear, and, as in yellow fever, recovery takes place after free evacuation of the bowels."

In the etiology of the cerebral disturbances in febrile forms of hepatic disease, the author shows himself an ardent supporter of the germ theory. Cerebral derangements in these cases are accounted for by the interference which germs bring about in the oxidative processes of the body. Whereas, cerebral symptoms which accompany the chronic forms of jaundice from obstruction and suppressed secretion, are due to the condition called bilæmia.

Here the author diverges somewhat from the text of his work to devote some pages to the germ etiology of pyrexia in general.

Next we find nearly a hundred instructive pages upon the subject of biliary concretions. With marked emphasis our attention is called to the fact that biliary concretions may be either true gall-stones or else simple plugs of inspissated mucus mixed with some bile, which in some cases may present, when found in the fæces, hard concretions, which may be mistaken for true gall-stones. The symptoms of colic are frequently the same, but the differential diagnosis can often be made, according to the author, by careful inquiry into the previous history of the patient. If found in the fæces their difference in shape, in consistency, and, finally, in composition, are easily determined. The solid constituents of true gall-stones consist of cholesterine, 98., pigment and mucus, 0.50, inorganic salts, 1.25.

The concretions consist of bile pigment, 84.2, cholesterine, 0.6, inorganic salts, 15.2.

Under treatment, the operation of choleo-cystotomy is recom-

mended if indicated, and later on, when speaking of the same subject under the heading of diseases of the gall-bladder, the introduction of the hypodermic needle into the gall-bladder, to be used as a sound for the detection of gall-stones, is referred to. The diagnostic value of the presence or absence, and of the quantity in some cases, of bile acids, melanin, leucin, and tyrosin, uric acid, and urea, is followed out at some length. It would naturally be supposed, from what the author has said at the outset, that here was to be the strength of the author's work. If we were to say that we were disappointed, I fear that we would rank ourselves with those dogmatists who, from the examination of a drop of blood, could determine the habits and constitution of the individual. The results have not thus far been all that may be desired, but the proof is ample that a careful chemical investigation has in some instances established an otherwise impossible diagnosis.

Quite something has indeed been added to our permanent knowledge in this direction, and the way indicated for future work.

Hepatic albuminuria receives some attention—the appearance of albumen and casts in the urine, the supposed result of irritation of the kidneys by biliary matter circulating in the blood.

The subjects of hepatic abscess and cancer are discussed at some length; and the succeeding chapters on fatty liver, hydatids, etc., are treated in the same intelligent manner.

Then at the conclusion follow many pages of hints as to differential diagnosis. As to these latter, we can truly say that they have value; but how great their value will always be determined, as it ever must in questions of differential diagnosis, by the sound sense of the person using them. Dangerous to a tyro, and even though unnecessary at times to the practised diagnostician, they will yet help to clear up many an obscure diagnosis for the skilful physician.

Were our author's fame to rest simply upon this work, we think he could safely entrust it to this book and an appreciative public. As to its dogmatism, we can readily accept the author's excuse in his preface: "In some portions of the volume the statements may, perhaps, appear to be rather dogmatic; if so, I may remind the censorious reader that this has arisen from the circumstance of so many old dogmas and deeply-rooted prejudices having to be combated. For I am quite as alive as he can possibly be to the fact that what one may regard as scientific truth is in no case incontrovertible certitude, and that the deductions of to-day in

an advancing science like that of medicine may require material alteration when viewed in the light of the morrow."

With such a spirit, our author in his work, even at the risk of diffuseness, has everywhere sought to sustain his statements and theories by facts. Throughout its pages are furnished the histories of cases, the results of examination, and no matter how the morrow may deal with some of the author's theories, the medical public must ever remain grateful for an addition and a record of our knowledge of facts that no future can change. Among the classical works upon the subject of which it treats, it must ever hold a foremost rank. [H. N. H.]

**A Treatise on Insanity, in its Medical Relations.** By Dr. WM. A. HAMMOND. New York: D. Appleton & Co.

This is a book of 768 pages; and the first systematic treatise on insanity published in America, although valuable works on insanity have been already published in this country by Rush, Ray, and others.

In the first section the author considers subjects usually placed at the end of most books. Chapter I treats of the nature and seat of the mind, and here he alludes to his paper, published in 1876, entitled "The brain not the sole organ of mind." But as he is about to treat of the diseases of the mind, he is evidently at a loss what to say about those disturbances of the mind which he has suggested are situated in the spinal cord and sympathetic, he is therefore compelled to say, that "though all nervous force partakes more or less of the attributes of that which we call mind, its qualities as exhibited by the force manifested by these latter two organs, as not of such a character, either in health or disease, as to come within the scope of the present treatise. It is with the mind developed by the brain that we have to concern ourselves."

In chapter II the divisions of the mind are disposed of; it is divided into perceptions, the intellect, the emotions, and the will; to make the subject more clear, diagrams composed of circles and lines are introduced.

The subject of the remaining chapters of this section are: chapter III, general remarks on the mental and physical conditions inherent in the individual, which influence the action of the mind; IV, eccentricity; V, idiosyncrasy; VI, genius; VII, habit; VIII, temperament; IX, constitution; X, hereditary tendency; XI, age; XII, sex; XIII, race.

There is nothing specially new in these chapters; they are all treated of in a pleasant half-popular style. Under the chapter on

race, we are not informed if there is any connection between race and the various forms of insanity.

The next section, of two chapters, is devoted to the consideration of the nature and seat of instinct. Section III, of six chapters, treats of sleep and its derangements, made up largely from a monograph by the author on this subject, and published in 1869,

Section IV, composed of thirteen chapters, is on the description and treatment of insanity. In chapter I the various definitions of insanity are given, and a brief description of delusions, hallucinations, and illusions; far too brief to be satisfactory.

Classification is discussed next; the various methods and plans alluded to. In speaking of the clinical classification, that of Kraft-Ebing is given. "On account of the recognized position of its author, as also of the fact that it is put forth as representing the present state of psychological medicine, I give it entire": but when it is read over, it is found not to be entire, as a large number of the subdivisions given by Kraft-Ebing are left out. Objection is then made to this classification, that it is too full in some respects, and too meagre in others. The author cannot understand why alcoholic insanities are introduced into psychological nosology, and not absinthic, and makes the mistake, undoubtedly an oversight, of saying that Kraft-Ebing does not include circular insanity in his classification; It will be found that Kraft-Ebing puts it under periodic insanities. The author does not believe that alcoholic insanities should have a place in a classification. He says: "I have not placed such forms as alcoholic mania, malarial mania, podagral mania, and many others of the kind in this classification, for I do not believe that the causes in such cases exercise any influence as a modifier of the type." In this we certainly cannot agree with Dr. Hammond, for the delirium from alcohol is in its terrifying hallucinations, illusions, and delusions, quite peculiar and characteristic. The author's classification is then given, and we cannot do better than reproduce it.

I. Perceptual insanities.

- a. Illusions.
- b. Hallucinations.

II. Intellectual insanities.

- a. Intellectual monomania with exaltation.
- b. Intellectual monomania with depression.
- c. Chronic intellectual mania.
- d. Reasoning mania.
- e. Intellectual subjective morbid impulses.
- f. Intellectual objective morbid impulses.

## III. Emotional insanities.

- a.* Emotional monomania.
- b.* Emotional morbid impulses.
- c.* Simple melancholia.
- d.* Melancholia with delirium.
- e.* Melancholia with stupor.
- f.* Hypochondriacal mania, or melancholia.
- g.* Hysterical mania.
- h.* Epidemic insanity.

## IV. Volitional insanities.

- a.* Volitional morbid impulses.
- b.* Aboulomania (paralysis of the will).

## V. Compound insanities.

- a.* Acute mania.
- b.* Periodical insanities.
- c.* Hebephrenia.
- d.* Circular insanity.
- e.* Katatonia.
- f.* Primary dementia.
- g.* Secondary dementia.
- h.* Senile dementia.
- i.* General paralysis.

## VI. Constitutional insanities.

- a.* Epileptic insanity.
- b.* Puerperal insanity.
- c.* Pellagrous insanity.
- d.* Choreic insanity.

## VII. Arrests of mental development.

- a.* Idiocy.
- b.* Cretinism.

In his preface, Dr. Hammond has expressed the hope that his work and classification will prove of assistance to the student desirous of investigating the phenomena of insanity. I am afraid this hope will not be realized. The classification of Kraft-Ebing is the best one we know of; it is clinical and can be made practical use of, and the student finds that this classification corresponds with the clinical types of insanity he meets with. In contrast, Dr. Hammond's classification, as far as we can see, can be of no possible kind of use to the student, but rather tend to confuse him. It appears to be an effort to combine a psychological and clinical classification. In making groups of perceptual, intellectual, emotional, and volitional insanities, it is making

a theoretical class which it is impossible for any one to follow in practice. The disturbances of these mental states are not so isolated that one can make them a basis of classification; they are all more or less involved in the various types of insanity. We cannot see any reason why hallucinations and illusions should be put down as types of insanity under perceptual insanities; they are symptoms only of disease, and at times occur without the person being insane. Following on this plan, delusions should have had a place under intellectual insanities. It is to be regretted that the author has not given us a classification that we can make use of in practice.

The great difficulty which the student finds in studying insanity is in making a proper classification; it is quite possible from his own study of the cases to recognize all the various well-defined clinical types of mental disorder, but when aid is sought from the various English treatises on the subject, the student at once finds himself thrown into confusion. The object of a treatise should be to give just this practical aid in classification and differential diagnosis, and in my opinion no English work, not even Dr. Hammond's, makes this subject clear, but rather confounds the student. Bucknill and Tuke's "*Manual of Psychological Medicine*," a most excellent work, gives more aid to the student than any one English work I know of. It is not intended by this criticism to convey the idea that English works on insanity are useless to the student. Far from it. What we need in English is a clinical manual on these diseases, similar to that by Professor Kraft-Ebing, which is unquestionably the best modern work on insanity, and he who makes an English translation of it will confer a benefit on the profession.

In treating of diagnosis, or differential diagnosis, the author is still more unsatisfactory than he was on classification. This is a subject upon which we should like to have had a little more information, especially as under *katatonia* (a condition, by the way, which Prof. Kraft-Ebing does not recognize as a distinct disease) Dr. Hammond quotes a case given by Kraft-Ebing as circular insanity, and asserts that the author has erred in his diagnosis, because, as Dr. Hammond says, it is a typical case of *katatonia*. We should like very much to have had Dr. H. give us the points in differential diagnosis between this case and those he has previously given under circular insanity.

The thirteenth and last chapter considers the treatment of insanity.

The question of sending a person to an asylum or not is discussed ; the moral and hygienic treatment, restraint, non-restraint, and occupation are considered. The medicinal treatment is then taken up. It is well known that the medicinal treatment is rather unsatisfactory, and often has no influence whatever on the disease ; and the author appears to be able to give us no new light on the subject ; he speaks of a number of medicines, among them bromide of sodium, and the other bromine salts ; and it appears that he recommends it in almost every form of mental disturbance, so that it leaves the impression of its being a routine treatment with the author. While speaking of treatment, we are reminded of two cases reported ; the one on p. 91, under the chapter on Age, we will quote :

"A boy about six or seven years old ; frequently during the day he would experience attacks of acute maniacal excitement, during which he would bite, kick, and strike at all who came near him, and destroy every thing within his power or reach. While the paroxysm was on him he was in constant motion, running and dancing around the room, climbing over the tables and chairs, gesticulating violently, and shouting or talking incoherently at the top of his voice.

"There was some evidence to show that when an infant in arms he had received a fall, striking his head. The place was pointed out differently by his mother and grandmother, but, acting upon what I conceived was the better evidence, I determined to trephine him. The operation was performed with Dr. Hunt's assistance, the cranium being perforated at the right parietal eminence. No injury of the bone was found, but recovery took place immediately, and the patient is now, as I believe, a healthy and sane young man."

We had always supposed that trephining was an operation performed only when there was positive evidence of fracture or depressed bone, and we are somewhat startled by this case and its results. We hope Dr. H. does not intend to have it understood that he recommends trephining insane persons upon such evidence as is presented in the case above.

When this work is considered as a whole, there are many subjects which will convey information to readers. Several mental disorders are described, for the first time in a book of this kind, although not new in periodical literature and monographs. It is well printed, and written in the easy, pleasant manner usual to Dr. Hammond.

[J. c. s.]

**Insanity, Its Causes and Prevention.** By Dr. H. P. STEARNS. G. P. Putnam's Sons, N. Y., pp. 248.

When one first takes up this little book, looks at its title, and knowing that Dr. Stearns is the Medical Superintendent of the Retreat for the Insane at Hartford, Conn., it is expected that its perusal will throw some new light on these two important subjects—cause and prevention,—in the history of the insane. But this hope is at once dispelled by a glance at the preface, which informs us that it is a collection of papers read at various times, and now somewhat revised and put in book form for the use of general practitioners, educators, and the more intelligent lay members of society.

The subjects considered are : Chapter 1. Preliminary. 2. Increase of Insanity. 3. Insanity and Civilization. 4. The Insane Diathesis. 5. The Influence of Education. 6. Industrial Education. 7. Moral Education. 8. Heredity. 9. Consanguineous Marriages. 10. Alcohol. 11. Tobacco. 12. Sex in Relation to Insanity. 13. Poverty. 14. Religion. 15. Insufficient Sleep. 16. Conclusions.

This work is intended as an educator of the public more especially, and is to accomplish the same end as the work of Dr. D. Hack Tuke, entitled "Insanity and its Prevention," and similar works.

The author protests against the over-taxing of young children with multitudinous studies which they cannot assimilate, and which are perhaps at best beyond their capacities, and therefore do not aid them in obtaining a living when grown up.

Under the chapter on Industrial Education, what appears to me an important subject is touched upon. From statistics of three insane asylums in two of the Eastern States, showing that from 30 to 42 per cent. of the persons admitted had no industrial occupation, the author argues that so many persons have never been taught in youth any regular occupation, trade, or business. This lack of systematic training of the nervous system in youth, at the present day, as was customary fifty to one hundred years ago, is one of the causes of a certain proportion of those becoming insane. This neglect of industrially educating the young, the author appears to attribute to the change in the methods of conducting business ; to the employment of machinery instead of hand labor ; the transferring of business trades to large establishments, instead of being done by a man with the aid of his children, thus

training in his craft, at an early age, those who are to follow him as workmen.

The thoughtful, unprofessional reader will find much in this little book to interest and instruct him ; and it is by the appreciation of these various subjects, treated of in this and similar books, by the people at large, that we must eventually hope to derive benefit by the prevention of insanity.

[J. C. S.]

## ORIGINAL OBSERVATIONS.

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### AN UNUSUAL HYSTERICAL SYMPTOM-GROUP.\*

By Dr. EDWIN WALKER,

PROF. OF DISEASES OF THE NERVOUS SYSTEM IN EVANSVILLE MEDICAL COLLEGE.

There is no disease which presents itself in more varied forms than hysteria. There is scarcely a disease that it does not at some time simulate ; the study of its manifestations, therefore, is of the greatest importance from a diagnostic point of view, for its rarer manifestations are often mistaken for symptoms of some grave disease, and much harm is done by inappropriate treatment. One cannot peruse the cases related in Weir Mitchell's little work on diseases of the nervous system<sup>1</sup> without appreciating the great importance of studying unusual forms of hysterical disease. I wish to relate a case which presented, in the first stage of labor, a group of symptoms closely resembling the premonitory symptoms of puerperal eclampsia.

When I was first called to see Mrs. L., she was eighteen years of age. It was in February, 1880. She had been married the September preceding. She had just had a convulsion, or, as her friends called it, a "spell." It consisted of irregular convulsive movements, not clonic in character, followed by a somnolent condition. She evidently did not lose consciousness, although she claimed she did.

She gave a history of "spells" from early childhood, but their exact character I could not learn. She began to menstruate at twelve years of age, and her paroxysms stopped until October, 1879, the month after her marriage, when they returned, and recurred at each menstrual period.

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\* Read before the McDowell Medical Society, May, 1883.

<sup>1</sup> "Lectures on Diseases of the Nervous System, especially in Women." Philadelphia, 1881.

At the time of my visit she had not menstruated for two months. Pregnancy proved to be the cause of the suppression.

I saw her again the next day after the paroxysm, and found complete left hemi-anæsthesia. This fact, together with the emotional character of the patient, the character of the paroxysms, and their connection with the menstrual period, together with her history, made the diagnosis of hysteria gravior quite plain.

It was evidently of quite severe type, from the early date it had appeared and the character of the symptoms. Let me here remind you, for it is often overlooked, that hysteria may exist in children at a very early age; Briquet says that one fifth of all cases begin before the twelfth year.

My patient continued in pretty good condition until the sixth month of her pregnancy, when she lifted a tub of water and ruptured the membranes, and a small amount of amniotic fluid escaped. After rest in bed the fluid would cease to flow, but would commence again on any unusual exertion. So she continued until the eighth month, when a large discharge took place and labor pains set in.

For three days she remained in bed, having occasional pains, but made no material progress. On the third day she began suddenly to complain of severe headache, and in a short time afterward said she was blind. This alarmed her friends, and I was summoned in haste. Her blindness certainly seemed real; I watched her very closely, and tried a number of ways to throw her off her guard, for I suspected shamming, but discovered nothing to warrant the suspicion. The pupils were neither dilated nor contracted, and responded sluggishly to light. An ophthalmoscopic examination was made with negative result. She did not flinch from the light from the mirror.

Hysterical amblyopia is mentioned by Charcot, Jolly, and others. True blindness, doubtless, does occur, but it is usually in but one eye, rarely in both. The results of ophthalmoscopic examinations have been for the most part negative, but Charcot's pupils found congestion of the optic papilla with œdema of its border in some cases. Whether Mrs. L. was one of these cases or was really shamming, is not a matter of special import to us in this connection. She said she was blind, and not being able to disprove it, we were compelled to consider the symptom in making our diagnosis. She had passed only a few ounces of urine in the preceding twenty-four hours. Here then was a patient in the first stage of labor, taken suddenly with pain in the head, and following it

complete loss of vision, and with a scanty flow of urine. Certainly these are symptoms which would immediately suggest impending puerperal convulsions.

Had I been unacquainted with the patient it is more than probable I would have considered it such, without further investigation. It was only by a careful consideration of the symptoms that my doubts were removed, for an hysterical patient may have puerperal convulsions.

Her temperature was 37.° C. Pulse and respirations normal; the urine contained no albumen, nor was there any œdema; these, taken together with the history, were the points from which the diagnosis was made. She recovered her sight in twelve hours.

I am unable to find in the standard works, either of obstetrics or diseases of the nervous system, any mention of the liability of confounding hysteria with the premonitory symptoms of puerperal eclampsia; the liability of confounding the convulsions themselves is briefly alluded to by Cazeaux (p. 804).

All authors on midwifery I have consulted (Leishman, Lusk, Cazeaux, etc.) mention headache, disturbances of vision, and scanty flow of urine as the more prominent premonitory symptoms of puerperal eclampsia. These were all present in our case.

The points of difference are as follows:

HYSTERIA.	PUERPURAL ECLAMPSIA.
History of hysterical attacks.	History of œdema of face, or extremities, and labia majora.
Mental state—emotional.	Mental state—irritable.
Urine may be scanty; no albumen or casts.	Urine scanty; albumen and casts.
Temperature normal.	Temperature sub-normal.
Pulse normal.	Pulse slow and hard.
Pupils normal.	Pupils contracted.
Headache general.	Headache confined to one side, or small area.

It may not be out of place to speak of the subsequent history and treatment of this case. She was safely delivered a few days after the attack referred to in this paper; she made a good recovery, and has never had an hysterical attack since that time. Now as to treatment. I explained the exact nature of the trouble to her husband, who is quite an intelligent man. I told him that when she complained, to pay but little attention to her; if she had any nervous manifestation, to treat it as a matter of no importance,

and under no circumstances to call in the neighboring women. I then told her that her troubles were entirely nervous in character, and explained to her that she could often control herself if she would.

I think that the essential mental trouble in hysteria is deficiency of will-power, with an abnormal craving for sympathy. Hysterical patients are often quite intelligent and can be made to understand their mental bias, and some of them can be induced to cultivate will-power. Whenever my patient seemed to be depressed or more nervous than usual, I would give tonics or sedatives as the condition required, but would always give her distinctly to understand that medicines were only of secondary import, and to be used only when occasion required. I further instructed her to keep busy at something, so that her mind would be diverted from herself. As I have said, she has not had any hysterical attacks since the one detailed in this paper, and has given up many of her emotional habits, crying, complaining, etc.

Had this woman been drugged with nauseous medicines, and been taught to rely on sedatives, the hysterical habit would have doubtless been so engrafted on her, that she would never have shaken it off. I say "hysterical habit," because many of the troublesome manifestations of hysteria become confirmed by repetition. For example: A nervous woman becomes worried from some domestic trouble; she has an hysterical convulsion; it produces a consternation in the house; she is consoled and sympathized with. This is repeated with like result. Finally the woman loses the power to control herself, and every annoyance brings on an attack. An intelligent treatment at the start will often save much trouble.

#### TWO CASES OF HYSTERIA.

- I, HYSTERICAL HEMIANÆSTHESIA IN A MAN, FOLLOWING INJURY; 2, HYSTERICAL ANÆSTHESIA OF SPECIAL SENSE, ACCOMPANYING CUTANEOUS HYPERÆSTHESIA.\*

By G. L. WALTON, M.D.,  
BOSTON.

The cases here reported, both under treatment in the department for diseases of the nervous system, at the Massachusetts General Hospital, were kindly referred to me for investigation by Dr. Putnam.

The first case, interesting chiefly on account of its etiology, was that of a fireman, with no history of nervous trouble previous to an

\* A paper presented at the meeting of the American Neurological Association, June 22, 1882.

accident which took place a few months ago, since which time, among other nervous symptoms, has appeared a typical hysterical hemianæsthesia.

The patient, C. W., aged fifty-five years, who has always been a robust, healthy man, was riding on his engine last November, when it was overturned, throwing him violently to the ground. He was taken up unconscious, and found to be severely bruised over the right side, including the shoulder and hip. He soon recovered consciousness and was taken home. He says that for some time afterward he had little use of the right arm and leg, and was confined to his bed over six weeks. Since that time he has suffered from a variety of nervous symptoms, including great pain in the back, loss of sexual desire, impairment of emotional control and power of concentration.

Examination, five months after the accident, revealed a condition corresponding to his statement, with the addition of a dejected look, and a tendency for the eyes to fill with tears while describing his symptoms. The patient, a large man with fine muscular development, walked, at this time, with a decided limp, and found the use of the right leg attended with severe pain in the hip, which did not, however, occur spontaneously, or only to a slight degree. There was a stiffness of the arms, and an impairment of motion, both voluntary and passive, at the right scapulo-humeral joint; and pain on forced movements, also to some extent occurring spontaneously, especially at night (periarthrititis).

Careful examination failed to reveal paralysis or atrophy of muscles, although the general strength on the right was impaired.

All forms of sensation were lessened over the whole body, much more markedly on the right side to the median line. A pin could be thrust through a fold of skin in most parts of the right arm and leg without causing pain. The punctures made in this way bled scarcely at all.

*Sight.*—There existed a concentric contraction of the field of vision on both sides, much greater on the right. The color-sense was unimpaired on the left, but with the right eye the patient had difficulty in distinguishing yellow and green. Examination of the fundus (made by Dr. Wadsworth) revealed nothing abnormal. Patient had hypermetropia of one dioptric. The visual acuity, normal on the left, was quite defective on the right, amounting only to about one tenth.

*Hearing.*—The watch (heard normally at 60–80 centimetres) was heard on the left at 30 centimetres, on the right only on con-

tact. The tuning-fork placed on the bone before the ear was heard plainly on the left, both with the ear open and closed, better with it closed. On the right it was heard faintly with the ear open, and scarcely at all with it closed. Placed on the teeth the tuning-fork was heard only on the left whether the ears were open or closed. The different tones of the scale were heard equally well, and all tones as high as C<sup>iv</sup> (4,428 v. s.) ; no examination was made at this time for very high tones.

*Examination of the ears* (after the removal of an accumulation of cerumen on the right) showed both membranes opaque, thickened, and indrawn (otitis media chronica). Both Eustachian tubes were permeable, though the Politzer air-douche produced no sensation on the right. The hearing in the right ear was practically unaffected by the removal of the cerumen.

*Taste and smell* were wanting on the right, not materially affected on the left.

The poles of a large electro-magnet were applied to the right forearm, so as almost to touch the skin. Before the application, only forcible pressure was perceived over this region ; after thirty minutes, the lightest touch was readily felt with the eyes closed. There was no transfer of the anæsthesia to the corresponding part on the other side, nor to any other part of the body.

The same magnet was applied to the right ear for twenty minutes, at the end of which time the lightest touch was perceived at any part of the concha or meatus, regions in which the anæsthesia before the application was especially noted. The patient was surprised to find that he could feel the touch of his own left hand to his right ear, which he had been unable to do before. At this time the tuning-fork applied to the teeth was plainly heard on both sides, whether the ears were open or closed. The watch, heard on the right before the application only on contact, was heard after it at a distance of 10 ctm. There was no transfer of the deafness to the other ear. The anæsthesia, general and special, returned in a few hours.

A few days later the same magnet was again applied to the right ear under the same conditions, excepting that the current was not passing, a fact of which the patient was ignorant. At the end of thirty minutes no change had occurred. The current was then allowed to pass, and in twenty minutes the anæsthesia, general and special, disappeared as before.

The patient's condition has gradually improved under galvanization and cold douches to the spine. The adhesions at the shoulder

were broken up under ether, since which operation massage, galvanization, and passive movement have been applied with benefit. Seven weeks after the commencement of treatment the general sensibility was normal on the left, much improved on the right; the retraction of the field of vision had disappeared from both sides; the patient could hear the watch at twelve centimetres, right; and the tuning-fork placed on the teeth was heard on the right as well as on the left, though not so plainly. That the hearing for high tones had been lost is shown by the fact that at this time the Konigs rod of 20,000 vibrations was unheard in the right, while that of 35,000 was plainly heard in the left ear.<sup>1</sup> Motion was fairly good, excepting as restricted mechanically at the shoulder and hips. The general condition of the patient was also greatly improved, and the emotional and despondent element had for the most part disappeared.

The leading symptoms of this case have already been reported in connection with another case of hemianæsthesia following injury, and attention has been called by Dr. Putnam, who reported them, to the fact that all the objective hysterical symptoms should be carefully sought for in cases of railway and similar injuries, inasmuch as wherever found they furnish tangible evidence of the utmost value.

The peculiar feature in the second case is the occurrence of anæsthesia of the special senses, combined with hyperæsthesia of the integument over the corresponding regions.

The patient, E. S., is a Portuguese girl, aged sixteen, a hair-worker, unmarried. No history of nervous trouble in the family is to be elicited. The patient states that she herself was always well until she came to this country, about one year ago. Before that time menstruation was free and painless; since that time it has been scanty and painful, though regular. Four months ago the left breast began to be painful and tender. The sensitiveness increased, and spread gradually to the back, head, and left arm. About three months ago she had an attack of unconsciousness following fright, and lasting two hours. No other distinct history of hysterical attack of any sort can be made out, although she is said to have had convulsive movements of the left arm. Patient is highly emotional, and is said to cry often.

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<sup>1</sup> Since sending this paper for publication, the hearing for high tones has improved so far that the rod of 30,000 vibrations is heard in the right ear, establishing the diagnosis of functional anæsthesia of the auditory nervous apparatus, and at the same time illustrating the value of the high-tone test in questions of diagnosis, a point elsewhere alluded to by the writer.

The patient is well nourished and well developed. Examination reveals extreme hyperæsthesia on the left, extending over the trunk, head, and arm. The hyperæsthetic tract is bounded sharply by the median line on the chest, back, face, and head, and extends downward to a line commencing behind at about the level of the tenth rib and passing directly around the body to the median line in front. The whole surface of the left arm is involved to a line about eight centimetres above the wrist, leaving the sensibility of the hand and wrist normal. The lightest touch over this entire region causes a grimace, and moderate pressure elicits a cry of pain. The breast is especially sensitive, but presents nothing abnormal in form or consistence; both breasts are large and pendulous. The patient complains of spontaneous pain in the left side, which comes on in paroxysms.

*Sight.*—There is concentric retraction of the field of vision on the left to about  $15^{\circ}$ . On this side blue is the only color distinguished, red being called black, and green and yellow, white. Hypermetropia of one dioptric exists on both sides. The vision, left, is  $\frac{1}{3}$ ; right,  $\frac{2}{3}$ . Examination of the fundus (made by Dr. Wadsworth) reveals nothing abnormal on either side.

*Hearing.*—The patient hears the watch on the right at 90 cm.; on the left neither watch, voice, nor tuning-fork by the air, and neither watch nor tuning-fork by the bone. The tuning-fork placed on the teeth or forehead is heard only on the right, even when the left ear is closed, a procedure which, as is well known, intensifies the sound conveyed by the bone when the nervous auditory apparatus is unaffected.

Examination of the membranes shows nothing abnormal.

The senses of *taste* and *smell*, normal on the right, are wanting on the left.

The electro-magnet was applied to the breast several times for periods of thirty minutes, with negative result. Where it was applied to the arm a slight decrease of sensitiveness appeared in twenty minutes.

A few days after the first examination the left hand became hyperæsthetic; also the front of the left knee just inside the patella. After twenty minutes' application of the magnet to each of these points the hyperæsthesia disappeared without transfer, leaving the sensibility of the knee normal as well as that of the hand and wrist to the previous line on the forearm. This relief of hyperæsthesia was permanent; at least the sensitiveness had not returned after a lapse of several weeks.

A few days after the appearance and disappearance of the hyperæsthesia on the left hand and knee, it appeared on the right trunk, covering exactly the corresponding region to that originally involved on the left side, excepting that the face, neck, and scalp were unaffected. The special senses on the right remained unaltered. This hyperæsthesia has persisted as well as that on the left, and the condition of the patient is otherwise the same now, after a period of four weeks, as when at first examined.

This case presents a marked exception to the rule that anæsthesia of the special senses accompanies that of the integument covering the organs of special sense. The rule, here deviated from is so constant that Féré has offered the suggestion, that there exist somewhere in the brain tracts which preside over both special sensibility and the sensibility of the integument covering the respective organs of special sense.

The writer has had opportunity to examine nineteen cases of hysterical anæsthesia of special sense ; and has, until this case, met with no exception to the rule. Even in those cases in which deafness, *e. g.*, coexisted with normal sensibility of the concha, careful examination has shown anæsthesia of the deeper portion of the external auditory meatus. In this case the opposite condition obtained, the integument over all the organs of special sense on the affected side being hyperæsthetic, as well as the tongue and cornea.

Although the deviation from the rule is so marked in this particular, the fact is still noticeable that the special senses remained unaffected on the right, even after the hyperæsthesia had extended to that side, so long as the general sensibility of the face and ear remained normal.

With regard to the diagnosis in these cases, if further proof than the physical examination were required to confirm it, the experiments with the magnet would have sufficed, whether the magnetism or the imagination is credited with effecting the change in sensibility. The fact that the anæsthesia in the first case yielded to the magnet when the current was passing, and persisted when it was shut off, represents the series of experiments upon which the supposition is founded by Charcot and others, that magnetism as such is an æsthesiogenous agent. It is true that diversion of anæsthesia has been in some cases brought about by a false magnet, as for example in a case witnessed by the writer in Westphal's clinic. Such cases do not, however, as pointed out by Charcot, prove that magnetism is inert, but merely that in very susceptible cases, the imagination may also act as an æsthesioge-

nous agent. A case like ours, in which the false magnet fails when circumstances are most favorable for the imagination (the patient having previously experienced the effect of the true magnet), is certainly a powerful positive argument for the effect of magnetism.

The disturbances of vision peculiar to hysteria, and illustrated in a typical manner in these two cases, have long been made the subject of careful study, but the investigation of the auditory function in this disease is of so recent date that it may not be out of place to recapitulate the results of the writer's study on this subject,<sup>1</sup> undertaken at the suggestion of Professor Charcot.

Deafness generally accompanies anæsthesia of the integument of the ear, or at least that of the deep parts of the external auditory meatus and the membrana tympani; the latter being shown not only by the failure to perceive the touch of the probe, but also by the inability to feel the entrance of air on insufflation through the Eustachian tube. The deafness corresponds, as a rule, with the degree of general anæsthesia.

When the latter is *complete*, *i. e.*, with loss of all varieties of sensation, the deafness is also complete, no sound being heard either through the air or by the bone. This degree of deafness is illustrated by the second case here reported, although cutaneous anæsthesia is replaced by hyperæsthesia.

When the general anæsthesia is *incomplete*,—for example, with analgesia and partial loss of the sensations of pressure, temperature, etc., the deafness is also incomplete, following, however, definite rules. The hearing through the bone disappears first in such cases, and in some is entirely wanting, while the hearing by the air is perfect, as in the case of one girl, who heard the watch on the affected side at a distance of over a metre, while the loudest tuning-fork, vibrating in contact with the skull, was only perceived on the other side. The high tones disappear before the middle and low, as in the case of a patient who could hear no tuning-fork above E''' (1315.8 vibrations).

The deafness in hysteria is quite analogous to that in old age, in which the hearing by the bone, and that for high tones, disappears first. It has been said that the conductivity of the bone for sonorous vibrations lessens in old age; this is, however, improbable, the more reasonable supposition being that, when the cerebral centres become dulled, either by age or by hysteria, those sounds disappear first which normally make the least impression

<sup>1</sup> "Deafness in Hysterical Hemianæsthesia," *Brain*, No. 20, 1883. See also "Verhandlung der Physiologischen Gesellschaft zu Berlin," Feb. 9, 1883.

on the auditory nerve, among which sounds must be numbered not only high tones, but also sounds conveyed by the bone.

In diagnosing hysterical deafness, lesions of the ear itself rarely offer difficulties, inasmuch as they are commonly situated in the middle or external ear (catarrh, cerumen) and are thus generally of such a nature as to intensify, rather than diminish, the sounds conveyed by the bone. The usual ease of diagnosis is illustrated in the first case here reported, in which, notwithstanding the accumulation of cerumen and the chronic catarrh of the middle ear, the vibrations of the tuning-fork, conveyed by the bone, were not heard at all on the anæsthetic side, a fact which made it at once extremely probable that nervous deafness was added to that of mechanical origin.

That the loss of hearing through the bone was due to hysteria, rather than through the advanced age of the patient, was already evident from the fact that it was unilateral, and confirmed by the fact that it disappeared temporarily under the use of the magnet, and permanently on the convalescence of the patient.



# ARCHIVES OF MEDICINE.

## Original Articles.

### A CONTRIBUTION TO THE STUDY OF ICTERUS NEONATORUM.

BY FREDERICK P. HENRY, M.D.,  
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THE following observations were made with the object of throwing further light upon the pathology of icterus neonatorum, and more particularly to determine the question of its hæmic or hepatic origin.

By the term icterus neonatorum I mean a discoloration of the skin, appearing from two to five days after birth, varying in hue from a slight sallowness to a decided yellow, disappearing gradually in about two weeks, and unattended by any marked symptoms of constitutional disturbance. In the milder cases the urine does not contain bile pigment, at least in sufficient quantity to stain the child's clothing, while in the more pronounced cases the napkins are decidedly stained by it. This definition excludes all cases of congenital imperfection of the biliary passages, all inflammatory affections of the liver, and gastro-duodenal catarrh; in a word, all cases of jaundice by obstruction. This being the case, it remains to consider whether there is any other form of mechanical jaundice than that by obstruction, and, if so, whether icterus neonatorum can be classed under it.

A few words are here necessary as to the classification of jaundice from the point of view of its etiology.

*I.—The mechanical or hepatogenic form.*

This is universally recognized, in so far as it is produced by any agency increasing the pressure in the bile ducts, and thereby favoring the entrance of the bile into the lymph- and blood-vessels. The converse of this, namely, that icterus may be caused by diminished blood-pressure in the portal vein, is by no means so generally acknowledged. Pylethrombosis, which is sometimes brought forward as a typical cause of the latter form of jaundice, is so in a theoretical sense only, for it is extremely doubtful whether such thrombosis is ever primary.

The occurrence of jaundice in fasting animals has been attributed to diminished blood-pressure in the portal vein, due to enfeebled action of the heart, and, therefore, classed under the head of hepatogenic or mechanical jaundice; but there is quite as good reason for classifying such cases under the head of hæmatogenic jaundice, for in them a rapid diminution in the number of the red blood cells can be demonstrated, while the diminished portal pressure is only inferential.

*II.—Hæmatogenic or chemical jaundice.*

Opinions are divided as to the existence of a form of jaundice in which the abnormal hue of the tissues is derived directly from the coloring matter of the blood. Nevertheless, there is very convincing evidence, both experimental and clinical, to be adduced in support of such a variety of the disease. For example, the injection into the veins of substances which are known to disintegrate the red blood cells, is followed by jaundice. The simplest of these substances is water. The red blood cells, when submitted to the action of water outside of the body, lose their coloring matter; and corresponding with this observation is the fact that injection of water in considerable quantity into the

veins, is followed by jaundice. The same result is produced by the vapors of chloroform and ether when brought in contact with blood contained in a gas chamber; and jaundice occasionally, though it must be admitted very rarely, follows prolonged anæsthesia by these agents in the human subject.

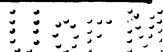
The jaundice of acute phosphorus poisoning, of malarial hæmaturia, and that occurring after the bites of venomous reptiles, is probably hæmatogenic; although in the first-mentioned variety, owing to the fact that phosphorus is an irritant to the gastro-duodenal mucous membrane, it is the opinion of some that the jaundice is hepatogenic or mechanical. In a case of acute phosphorus poisoning, which was recently under my care at the Episcopal Hospital, there was an intense degree of icterus; nevertheless, at the autopsy the gall-bladder was found empty, which would certainly not have been the case had the jaundice been of mechanical origin.

### III.—*Jaundice by suppression.*

Harley is the most prominent advocate of such a variety of icterus. He considers that the bile pigment, like cholesterolin, is preformed in the blood, and is merely separated by the liver. E. Wagner<sup>1</sup> regards the opinion that there is such a form of jaundice as no longer tenable, and refers to experiments upon the removal of the liver by Müller, Kunde, and Moleschott. The question may be regarded as still open, although the advocates of this form of icterus will probably admit that there are two forms of jaundice by suppression; one in which the accumulation of pigment is due to imperfect action of the liver, therefore *hepatogenic*; another in which more pigment is formed in the blood than can be separated by even a healthy liver, therefore

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<sup>1</sup> "Manual of General Pathology," Am. ed., p. 557.



*hæmatogenic*. The advantage, therefore, of this supposed variety is by no means apparent.

From the foregoing remarks it is, I trust, manifest that I hold to the division of cases of jaundice into hepatogenic or mechanical and hæmatogenic or chemical, and believe that further study will settle either the exclusive or, at least, the preponderating influence of one or other of these causes in every case of icterus.

To produce experimentally the first of these two forms of icterus, it would be necessary to increase the bile-pressure *absolutely* by ligature of the hepatic or common bile-duct, or to increase it *relatively* by cutting off a portion of the portal blood-supply. Now, this latter experiment is performed in the case of every human being by ligature of the umbilical cord. The portal blood-pressure is suddenly and markedly diminished; abnormal conditions of osmosis are established, and when jaundice ensues it is only necessary to prove that the number of the pigment-carriers, *i. e.*, the red blood cells, has not been reduced, in order to settle the question of the mechanical origin of icterus neonatorum.

This is what I have done, by counting the blood cells in a few new-born children, and because, so far as I can ascertain, it has never before been done; there is scarcely an affection of which the etiological status is more uncertain.<sup>1</sup>

The following observations were made at the Maternity Hospital<sup>2</sup> in the autumn of 1881.

CASE 1.—Oct. 19, 1881. Alice K., born at 8 A.M. Count made at 10:30 A.M. The child was of average size and not cyanosed. Labor had been natural and easy. No symptoms of suspended animation. Child crying lustily when born. Weight,  $8\frac{1}{4}$

<sup>1</sup> I refer, of course, to counting the blood cells in the neonatus with especial reference to the cause of icterus neonatorum, although unaware of its having been done for any purpose.

<sup>2</sup> Formerly called the State Hospital for Women and Infants. For the opportunity of making these observations, I am indebted to the courtesy of the officials of the institution, and particularly to Dr. J. V. Ingham.

lbs. The blood was obtained by puncture of the great toe, and was venous-looking. (The average number of red blood cells per cubic millimetre is, in the adult, *at least* 5,000,000.)

Number of red cells per cubic mm., 6,410,000.

No white in specimen examined.

Oct. 20th, 10:30 A.M. Second count in the same case. Child thriving.

Number of red cells per cubic mm., 5,810,000.

Oct. 22d. Third count in the case of Alice K. Child doing well; no appearance of jaundice.

Number of red cells per cubic mm., 5,680,000.

The above case proves that a rapid and great diminution in the number of the red blood cells may occur during the first few days after birth, without the supervention of jaundice. That this diminution in the number of cells per cubic mm. was not caused by the absorption of water, is proved by the following facts: The child before birth is suspended in the amniotic fluid, and therefore in a condition far more favorable to the absorption and retention of water in the system than after its removal from the body of the mother. During the examinations of the blood, the only fluid ingested by this infant was that obtained from its mother's breasts, and this, the colostrum, was of small amount. On the other hand, water passed freely out of the system through the kidneys and skin, so that the conditions were eminently favorable to the production of an increased percentage of blood cells, a kind of spurious plethora, through diminution in the normal amount of water in the blood. Nevertheless, the percentage of red blood cells was reduced, and therefore they must have been destroyed.

CASE 2.—John G., born Oct. 20th, at 12 (mid-day). Labor easy and natural. Child not asphyxiated; weight, 8 lbs. Count No. 1 made at 11 A.M., Oct. 21st.

Number red cells per cubic mm., 5,925,000.

This count corresponds closely with count No. 2, in case No. 1, which was made about the same time after birth.

Count No. 2, Oct. 23rd.

Number red cells per cubic mm., 5,520,000.

Faint yellowish tint of skin.

Count No. 3, Oct. 25th.

Number red cells per cubic mm., 4,870,000.

Child deeply jaundiced.

CASE 3.—Mary C., born 5:20 A.M., Nov. 5th. Count made at 2:30 P.M., Nov. 6th. Child weighed  $6\frac{3}{4}$  lbs. at birth. Labor natural.

Number red cells per cubic mm., 3,625,000.

Proportion of white cells to red, 1 to 145.

This case was undoubtedly one of *congenital anæmia*. The child's only appearance of mal-nutrition was a shrivelled state of the integuments of the feet and a less rosy color of the skin than normal. For a new-born child it was decidedly pale. This shrivelled state of the skin emphatically negatives the idea of a relative anæmia from excess of fluid. The blood was probably deficient in quantity (*oligæmia*) as well as defective in quality (*oligocythæmia*). There was also a decided increase in the number of the white cells. Careful inquiry proved that there had been no hemorrhage from the cord. As possibly bearing upon the congenital imperfection of this child, I may mention the facts that the parents were themselves immature—the father being seventeen and the mother eighteen years old. But one examination could be obtained in this interesting case, and therefore it has but a remote bearing upon my subject. I introduce it for its own inherent interest.

CASE 4.—Wm. S., born Nov. 6th, 5 A.M.; weight,  $6\frac{1}{2}$  lbs.

Count No. 1, Nov. 7th. Number red cells per cubic mm., 4,520,000.

White cells to red, 1 to 904.

Count No. 2, Nov. 8th, 11 A.M. Number red cells per cubic mm., 5,335,000.

White cells to red, 1 to 711.

Child slightly yellow.

CASE 5.—Sela F., female, born Nov. 17th, 8:15 A.M.; weight, 7 lbs.; labor rapid and natural; child healthy-looking.

Count No. 1, Nov. 19th, 10:30 A.M.

Number red cells per cubic mm., 5,185,000.

Number white cells to red, 1 to 350.

Count No. 2, Nov. 21st, 4 P.M.

Number red cells per cubic mm., 5,495,000.

Number white cells to red, 1 to 628.

Slight icteric hue of skin.

From the foregoing observations no argument can be advanced in favor of the hæmatogenic origin of icterus neonatorum; for while it is true that in case 2, the only one in which there was marked jaundice, this condition coincided with a rapid and great diminution of red cells, it is also true that in case 1 there was a very decided loss in red cells without the occurrence of jaundice, and that in cases 4 and 5, with a slight degree of icterus there was an increase in the number of red cells.

The next questions which naturally arise in connection with this subject are: If this icterus is not hæmatogenic, why does it not invariably occur, since the umbilical vein is ligatured in all new-born infants, and why has the statement been made and corroborated by excellent observers, that it is more frequently met with in delicate children than in the robust?

I admit both of the facts implied in the above questions, and propose the following explanation:

The degree of immediate interference with the portal circulation produced by ligature of the umbilical cord, depends both upon the anastomoses of the umbilical vein with the veins of the abdominal wall, and upon the vigor of the cardiac contractions. Where there is free anastomosis and a vigorous heart, the intravascular blood-pressure in the hepatic lobules may be maintained to such an extent as to prevent the absorption of bile, and *vice versa*. I may here

mention, as bearing upon this subject, that the size of the heart, which in the adult is as 1 to 160, in the foetus is as 1 to 120. This preponderance of cardiac force in the new-born child is a provision of nature for the establishment of new circulatory channels, rendered necessary by the ligature of the cord and the beginning of respiration.

Facts are not wanting to show that the umbilical vein often continues pervious through life, but it is to be regretted that they are not given with more attention to detail. Thierfelder states that it continues patulous in "most human beings." Bamberger has "frequently found the umbilical vein in adults pervious to a fine sound"; and Hoffmann has reported a case of cirrhosis, in which he demonstrated an anastomosis between the greatly dilated umbilical vein and the inferior epigastric. In cases of cirrhosis, a patulous condition of the umbilical vein and anastomoses with veins of the abdominal wall, may, through the establishment of a reverse venous current, be in a high degree conservative.

It is true that Sappey has denied that a vein frequently found in the ligamentum teres is identical with the umbilical vein, but there can be no doubt regarding the case of Hoffmann, for he traced the vessel to its communication in the transverse fissure with the portal vein, and through the open ductus venosus, with the vena cava inferior.<sup>1</sup>

As an instance of the confusion attending the subject of icterus neonatorum, I may mention, that while one set of observers attribute its causation to the sudden diminution of blood-pressure in the hepatic vessels produced by ligature of the cord, Dr. West<sup>2</sup> states that "in many instances of it the foetal passages are still pervious, and the blood

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<sup>1</sup> For reference to cases of patulous umbilical vein, see *Ziemssen's Cyclopadia*, Am. ed., vol. ix, p. 185.

<sup>2</sup> "Lectures on the Diseases of Infancy and Childhood."

circulates in part through channels which ought to have been closed from the time of birth."

The knowledge that the umbilical vein continues pervious in "many instances" of icterus, can only have been obtained by means of autopsies, and it is to be regretted that the general statement is not supported by some particular facts. Since none such are given, I am not inclined to accept it.

For the umbilical vein to continue pervious after ligation of the cord, there must be anastomoses with veins of the abdominal wall, and in order that this collateral venous circulation be at once established, there must be a certain degree of vigor on the part of the heart. Where one or other of these factors is wanting, thrombosis will occur in the vein, and, therefore, the unsupported statement that the umbilical vein continues pervious in many instances of icterus, is opposed to the undoubted fact that the affection is most common in weakly infants.

In my argument I, of course, assume that the current of blood in the umbilical vein, when this remains patulous after birth, is, as before, toward the liver. This, although not susceptible of proof, is much more reasonable than to suppose a reversed current, as in cases of cirrhosis.

In cases in which the umbilical vein does not remain permanently patulous, the usual period of its obliteration may be prolonged, owing to the above-mentioned anastomoses, and this more gradual obliteration may prevent the occurrence of this form of mechanical jaundice.

The fact of varying degrees of icterus neonatorum, harmonizes completely with the theory of a venous anastomosis more or less extensive, and a cardiac contraction more or less powerful; while on the theory of a hæmatogenic icterus, it is impossible to explain why, of new-born children under precisely similar conditions, some should be the victims of a blood dyscrasia, whose only sign or symptom is a discolora-

tion of the skin, while others should present nothing of the sort.

As to the frequency of icterus neonatorum, opinions vary from the one extreme of denying its existence to the other of believing that it is more or less present in all new-born children, its lighter grades escaping detection because they are not carefully looked for. I cannot concur in this latter opinion. While it is true that there are none so blind as they who will not see, it is also true that the willingness to see is at least as productive of positive results as is the unwillingness to see, of negative. Leaving the will, however, out of the question, it is undoubtedly the case that icterus neonatorum is far more common than is generally supposed.

Harley does not consider the affection a form of jaundice at all, and objects strenuously to the term icterus neonatorum, which he calls a "learnedly sounding name," and proposes for it that of *chlorosis* neonatorum, which, to the ear of the writer, has quite as learned a sound, and conveys impressions concerning the pathology of the affection which are not substantiated by a single fact.

The known fact that the portal blood-pressure is suddenly diminished by ligature of the umbilical cord, and the further facts recorded above as to the number of the blood globules in the neonatus, lead me to the conclusion that icterus neonatorum is of the mechanical or hepatogenic form, and that the term chlorosis neonatorum, proposed by Harley for this affection, is a misnomer.

## SOME POINTS ON THE MECHANICS OF THE HIP-JOINT IN REGARD TO THE TREAT- MENT OF MORBUS COXARIUS.

By J. S. WIGHT, M. D.,

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**T**HE femur is a bent lever, and its motions are : adduction, flexion, abduction, extension, inrotation, out-rotation, and circumduction. These motions are caused by muscular contraction. When one set of muscles that span the hip-joint contracts, the femur is moved, and there is also pressure, or stress, on the hip-joint surfaces. The pressure on the joint surfaces in the adult may be as great as 2,000 pounds, and will be proportionally less than this in early life.

In this place the following proposition may be made: Two sets of muscles, that are antagonistic, are more nearly in equilibrium, when the bone that they move cuts the arc of their motion nearer its end on the side of the more powerful set of muscles. For instance, when the forearm is somewhat more than semiflexed, its flexors and extensors are more nearly in equilibrium than when the forearm is in any other position. Again, for instance, when the leg is not quite semiflexed, its flexors and extensors are more nearly in equilibrium than when the leg is in any other position. When the knee-joint and the elbow-joint are injured or diseased, if the limbs are left to themselves, the leg and the forearm will tend more and more in the direction of flexion. For a similar reason, in a case of injury

or disease of the hip-joint, there will be a tendency to flexion and abduction of the thigh.

It is important, in connection with the above proposition, to note, that the femur may be adducted from a line parallel with the long axis of the body about thirty degrees; that it may be abducted from the same line about thirty degrees; that it may be extended somewhat beyond the same line; and that it may be flexed till the thigh comes in contact with the abdomen. The names of the different groups of muscles that span the hip-joint and move the femur need not now be enumerated.

Also, it is important to note, that when the lower limb is measured from the superior anterior spine of the ilium, adduction of the lower limb makes it measure longer, abduction of the lower limb makes it measure shorter, extension of the lower limb make it measure longer, and flexion of the lower limb makes it measure shorter. When the pelvis is tilted upward, adduction of the lower limb takes place; when the pelvis is tilted downward, abduction of the lower limb takes place; when the pelvis is tilted forward, flexion of the lower limb takes place; and when the pelvis is tilted backward, extension of the lower limb takes place. The effects are the same whether we move the thigh or tilt the pelvis.

Now let me ask the following question: What will be the effect of flexion of the thigh on the muscles that move the thigh? All those muscles whose points of origin are in front of the femoral head will have their origins and insertions brought nearer together, and will therefore be shortened. Again, let me ask: What will be the effect of abduction of the thigh on the muscles that move the thigh? All those muscles whose points of origin are external to the femoral head will have their origins and insertions brought nearer together, and will therefore be shortened. This

group of muscles is very powerful, and includes the sartorius.

If, then, we somewhat flex the lower limb, and at the same time slightly abduct it, we shall put the thigh in such an attitude, as to bring the points of origin and insertion of the greater number and of the strongest muscles of the hip-joint nearer together, and put the opposing muscles more nearly in equilibrium. In order to accomplish this desirable result in a case of *morbus coxarius*: Let us put our patient on a bed whose foot-end is somewhat elevated, so as to make the weight of the body cause counter-extension; raise the head and upper part of the body somewhat by means of a pillow, so as to gently flex the lower limb; and put adhesive extending straps on the lower limb, adding the effect of a moderate weight, so as to tilt the pelvis and abduct the thigh. And when this has been done, another condition will supervene, which will be seen to be important: the lower limb will be outrotated. The inrotators of the lower limb will be somewhat relaxed by the flexion above noted, and that will diminish the muscular antagonism to outrotation, and the extension applied to the lower limb will tend to cause outrotation, and at the same time aid in causing the inrotators and outrotators of the thigh to be in a state of equilibrium.

Now what do we actually find in a recent case of *morbus coxarius*? We find the pelvis on the side of the disease tilted downward, and the lower limb on that side abducted; and we also find the limb on the side of the disease outrotated and somewhat flexed. So that the facts agree with the theory: and the explanation of the facts is consonant with the reasons for the theory. While it is not proposed to separate the joint-surfaces in a case of *morbus coxarius*, it is competent and salutary to diminish the pressure of one of these surfaces on the other.

In this place let me compare the weight of the body and the dynamic effect of the contraction of the muscles that span the hip-joint. In the case of a patient weighing sixty-five pounds, it can be shown, that the action of the psoas and iliac muscles, as they flex the thigh, can press the femoral head against the acetabular surface with a force equal to eighty-five pounds, so that the flexion and suspension of the lower limb, during the act of locomotion, may compress the joint surfaces more strongly than the simple superincumbent weight of the body. If now we add to this dynamic condition the fact, that the body is kept upright, as it rests on the femoral head, by means of the contraction of the muscles that span the hip-joint, the pelvis acting as a lever of the first order, we shall readily see how greatly the pressure on the joint-surfaces will be augmented. In fact, the muscles that span the hip-joint, as a part of a neuro-muscular apparatus, in a case of *morbus coxarius*, are competent to apply to the joint-surfaces a pressure of from one hundred to a thousand pounds. And inasmuch as the inflamed tissues of the hip-joint may set in motion the neuro-muscular apparatus at any time, they may receive the detrimental effects of exaggerated muscular contraction.

Now, in a case of *morbus coxarius*, it is impossible to remove all pressure from the surfaces of the hip-joint, and if it were possible, it would not be good practice. The surfaces of the hip-joint and the subjacent tissues were made to operate under certain dynamic conditions; they have a special mechanical environment. The normal state of these tissues is only attainable when their molecular structure is under the normal stress—or, as we say, pressure—of the healthy contraction of their environing and moving muscles. Exaggeration of muscular action and want of muscular action will both tend to be detrimental. Sup-

pose, by way of illustration, the surgeon were to remove the normal pressure of the atmosphere from an inflamed surface, there would be no difficulty in appreciating the effect. And that effect would be very suggestive in regard to the effect of the entire removal of pressure from the joint-surfaces in a case of *morbis coxarius*.

Now, what is the condition of the structures under consideration? Some of the tissues of the joint are irritated; the nerves which communicate with these tissues are also irritated; the muscles which communicate with these nerves are irritated; and these muscles, as they span the hip-joint, are induced to contract in an exaggerated way. The result is, that the inflamed structures have lost their proper and normal adjustment to their neuro-muscular environment. In the meantime, it may be said that the irritation which has caused the inflammation, and disturbed the molecular and mechanical conditions and relations of the hip and its joint, may have had a constitutional or a local origin: we are not now discussing this question. But we may be led to remark, that the great majority of small boys and many small girls ought to have *morbis coxarius*, if the traumatic theory of this disease is exclusively true, because they are frequently falling on their hips, as well as on their backs.

If, now, we put our patient, having *morbis coxarius*, on a bed, elevate the foot of the bed for the purpose of counter-extension, raise the head and the shoulders somewhat on a pillow, apply an extending weight of six or eight pounds to the limb on the diseased side by means of proper apparatus, we will put the joint-tissues in a way to be pressed upon so that they will be approximately adjusted to their environment, because: (1) many of the muscles that span the hip-joint will have their origins and insertions brought nearer together; (2) because the antagonistic groups of muscles

will be more nearly in a state of equilibrium ; and (3) because the extending weight, acting under the force of gravitation, and being always ready to act, will counteract the contracting muscles that span the hip-joint, and thus remove from the molecular structure of the hip-joint a very considerable part of the work that these muscles can do. These muscles are in an irritable and spiteful state, and having no discretion, will do too much work,—and so we let them work by lifting weights, instead of permitting them to drive the femoral head into the acetabulum. In fact, we tire out the muscles that span the hip-joint, and when they are in a condition to behave themselves in a better manner we take off the extending weight, put on somebody's splint, if it is well constructed, so as to repress and equalize the muscular contraction, and get our patient up and about, in order to prevent the deleterious effect on the general health of a too-long confinement in bed and in-doors.

## FIRST LINES IN PATHOGENY.

By I. L. TEED, M.D.,

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**I**F a portion of a viscus, or of any organ, is examined under a microscope, we observe a number of cells of a special kind held together by a matrix made up by cells of another kind, and separated into territories by canals of different kinds, with an interlacement of fine grayish fibres ; or the matrix may be composed of fine fibres derived from a cellular structure which has preceded them.

The study of these arrangements in the different organs and tissues constitutes histology, and is of very considerable importance to the physician.

But such a field bears about as much resemblance to what would be observed if the section could be viewed in the active working of life, as the contemplation of the moon would bear to the study of the earth covered with the active bustle of living beings. Such a contemplation is not a sufficient basis for the study of physiology. It cannot, therefore, suffice for the study of pathology ; for pathology is the physiology of the body when it has lost the order and regularity or harmony of health. Yesterday, the body was in a physiological condition ; it fell under some disturbing influences, and to-day it is in a pathological condition.

In what lies the difference between the histologic specimen and the living organ ? In the first place, in the section there is no ceaseless flow of fluid matter with its inpourings and its outpourings ; and in the second place, these pale gray fibres, separated from their reservoirs, are no longer

the conduits of ceaseless currents of energy or force. In the section the cells and fibres may remain unaltered for centuries, if properly preserved ; in the living organ, they are the subjects and the causes of incessant changes ; and these changes may themselves induce further changes, which shall be felt to the extremest boundaries of the individual of which that organ formed a part, and be also transmitted for centuries to that individual's descendants.

If the order of life depends on changes in matter of certain degrees and kinds, it follows, as a corollary, that the disorder of life depends on variances in the degrees or kinds, or both, of these changes. In other words, that all disease is structural, and that independent of change in structure there is no disease. Yet this idea is far too exclusive ; for the body, like all other terrestrial bodies, is affected by currents of force passing in close proximity to it ; its electric condition becomes changed from induction, and dynamic disturbances may be produced in it which consist entirely of waves of force transmitted in extraordinary directions, and the material changes which ensue are products and not causes.

For many years the cell-theory has held nearly exclusive sway in the doctrines of medicine. The cell is looked upon as the source of all life and activity ; all very well when we add to it a pabulum on which it may live, and a dynamism which may direct its activity. The physiology of the *amœba*, or of the *hydra polype*, can be no basis for human pathology ; nor, indeed, can the physiology of any being not human. Man is a law unto himself and to his race.

The old divisions of the medical schools, into Humoralists, Vitalists, and Solidists, have their antetypes in the cell-theories, the vascular theories, and the nervous theories of to-day. They all err alike in their exclusiveness, in denying the co-correctness of the other two.

In addition, therefore, to the cellular element of each and every part, we must add two other elementary components,—its vascular and its nervous elements.

These three constitute the elementary component parts of each and every organ and tissue, and besides these there is no other ; as disease consists in disturbance of one or more of the component parts of the organ or tissue, all forms of disease will be comprised in

- 1, disorders of the cellular element ;
- 2, disorders of the vascular element ;
- 3, disorders of the nervous element,

of the affected organ or tissue, or in a combination of two or more of such disordered elements : and therapeutics will consist in the knowledge of the mode in which remedies act on these elementary parts.

Let us consider what transpires during the briefest period of the life of an organ ; and we will suppose the organ to be in health. Its cells are healthy ; its vessels of normal size and calibre, their vaso-motor nerves possessing the proper tension ; its nerves are receiving and transmitting normal waves of force to and from the nerve-centres ; the blood it receives is normally constituted, with its due amount of albumen, red corpuscles, salines, and water, and bearing a due supply of oxygen gas, of hydro-carbons, and of carbo-hydrates in solution ; not overloaded with an excessive quantity of waste matter *en route* for excretion, or rendered impure by the presence of foreign matter. In short, the body and the part are in health.

When the blood flows into the capillaries, and from them into the intercellular spaces, several series of decompositions and of recompositions begin to occur. Part of the substance of the cells (cell-contents) is oxidized, and becomes split into two series of compounds,—one nitrogenous, the other non-nitrogenous ; the former containing the fibrin

formed in the part during this first step of tissue-metamorphosis. Carbo-hydrates become oxidized, forming carbonic acid and water ; and hydro-carbons also with similar results ; salines also undergo change, and sulphur and phosphorus become oxidized.

The first result of the oxidation of hydrogen and the formation of water is, that the water in the part is increased in quantity, so that the veins cannot carry it back as well as the blood brought in by the arteries. We find, therefore, in addition to them, as an outpour from the part, the lymphatic vessels, which remove this excess of intercellular fluid, consisting mostly of water holding fibrin in solution.

During these oxidations of albuminoids, hydro-carbons, and carbo-hydrates, matter is being reduced from more complex to less complex states of chemical combination, and with such reduction in complexity is a necessary corresponding liberation of combining energy (chemical attraction). A part of this liberated energy forms the normal heat of the part ; while another part of this liberated energy excites molecular movements (polar) in the nervine conductors, and is thereby conveyed from the part by the afferent nerves to the nerve-centres, to be thence reflected by the efferent nerves, in part to the organ itself, in part to other organs, in part diffused through the nerve-centres ; while at the same time the efferent nerves convey to the part we are considering reflex waves from the other parts of the body. During this series of actions blood albuminoids are decomposed, nitrogenous matter being taken up by the cells to replace that which has been oxidized, other matters, nitrogenous and non-nitrogenous, being formed for the nutrition of other parts, so that it is all consumed when and as required. Under cell-activity, changes in matter, often of an isomeric character, are effected, and the

secretions of the various cells become formed. Thus again we find our three elementary parts,—the cellular, the vascular, and the nervous ; and besides these, none.

The same result is reached by the study of the development of the individual, and of the gradual ascent in the scale of being. At first we have the formation of cells ; then of a cell pabulum, the vascular element ; and finally of the dynamic or directive element, the nervous element. However great may be the changes, and however varied may be the forms of these elements, no new element is formed in addition to these.

This view also brings into prominence what we know as "morbid processes" ; those first deviations from the normal which constitute the starting-point of those entities which finally constitute our nosological tables. Moreover, the appreciation of these morbid processes renders diagnosis easy, and affords the only sure basis for rational therapeutics.

Disorders of the cellular element consist in deviation from the normal life-routine of the affected cells. Their life-work consists in nutrition, comprising the absorption, metamorphosis, and discharge of matter ; in growth and reproduction ; in changes of a special and particular kind induced in matter, alternating in secretion, or in the formation of blood ; or in changes produced in waves of energy or force, alternating in the varied manifestations of nerve force, sensory, ideational, or motor.

The cells may absorb too much matter, and hypertrophy ; too little, and atrophy ; or matter of a wrong kind and be infiltrated ; or they may not discharge effete matter, and degenerate ; they may increase too much or not enough, or the mode of their increase may be abnormal. Thus they may form a neoplasm resembling the original tissue, as in tubercle ; diverse from it, as in syphiloma ; or abnormal in mode, as when by vacuolation they form a cancer. They

may react improperly on matter and form an abnormal secretion ; or they may fail in such action altogether, when their secretion is suspended ; while their dynamic activities may be disordered when local disorders in peripheral organs will give origin to neuroses of various forms : for if all parts of the body are represented in the nervous centres, dynamic peripheral disorder will induce central nervous disturbance.

Thus disorders of the cellular element form no small portion of human pathology ; while the therapeutic question naturally follows : How can the cell-element be influenced in the desired way to produce the desired results ?

Disorders of the vascular element are among the most prominent of all forms of disturbance, and have been considered, though erroneously, as the whole cause of departures from health. There may be too much blood in the body (plethora), too little blood (anæmia), or its composition may be changed : first, by changes in the proportions of its normal constituents, more or less, as water, albumen, fibrin, red and white corpuscles, fat, salines ; secondly, by increase of the waste products it should normally contain, nitrogenous, carbonaceous, or hydrogenous compounds (toxæmia) ; or, thirdly, by the introduction of foreign matters which it ought not to contain (pus or sepsin) ; or, lastly, its distribution may be deranged, as in hyperæmia, active or passive ; increased arterial tension, or diminished arterial tension.

Disorders of the nervous element present the most difficult problems in pathology. Where there is no nervous system, every cell possesses all the dynamic qualities which every other cell possesses. But after a nervous system has been developed, the other cells have their dynamic powers abridged, while those of this special (nervous) system have their dynamic powers enlarged ; and their dynamic powers being enlarged, they are also made dominant. Thus, while

in the amœba a projection of some portion of the mass occurs in consequence of an impulse originating in that part, in man a leg or an arm is moved in consequence of an impulse originating in some central part of the nervous system (as a rule), and conveyed by efferent conductors to the part moved ; and if these efferent conductors be severed, no active movement of the part can by any means possibly occur. Not only is the motor force (power) taken away during development from the cells of the leg and arm and given to some cells of the nervous centres, but the motor arrangements of the leg and arm are rendered subject to these same central nerve-cells, and move when they are told to move (receive a motor impulse), and do not move until the message (motor impulse) has been received.

Moreover, all this energy or force is derived from the liberation of the energy stored up in the food during its reduction from more complex to more simple forms of chemical combination.

Under a gradual decay of strength and substance, owing to a perverted metamorphosis of matter, the nutriment of the blood being consumed in the growth of a fungus hæmatodes, the sight began to fail, and at last entire blindness was the result, there being no pathological condition of either eye, except anæmia ; and a similar result is occasionally observed in diabetes mellitus. Similar results have been observed in cases of simple starvation.

In the fish the egg is laid on the sand, there it becomes fertilized by the sperm from the male, and is left to itself. The young fish has a small store of nourishment in its yolk-sac to last it a short time. After that is expended, it derives all the matter that goes to make up its bulk at maturity, and all the force or energy which it exhibits, from the food which it consumes, and from that only. In the same way the human embryo, although formed by the fertilization of

the ovum by the sperm cell within the body of its female parent, is as much an independent, living, individuality as it becomes after birth, and gains its substance and its energy from its food, and from its food only. But as a certain body-temperature is necessary for the continuance of the union of its life with its matter, its development is performed within the body of its mother, whereby that temperature is preserved. While in the case of the chicken the necessary temperature is maintained by the application of the hen's body to the eggs.

The dependence of nervous energy on the introduction of matter into the body, as food, is seen more fully on the introduction of other substances, as alcohol, opium, cannabis, etc., as well as in the effects of insufficient food. The "gospel of fatness" has been long applied in the treatment of various forms of mental disease, as well as in the treatment of various forms of other somatic disease. Compare Clouston and Blandford on feeding in insanity, and Thomas on feeding in female complaints.

The axis-cylinders of the nerve-fibres and the neurine of the cells may be both considered as "cell-contents"; they are continuous with one another; and the office of each in the transmission of nervous energy is to vibrate, most probably in a polar manner; for if there is no molecular vibration (movement) there can be no transmission of nervous energy; during absolute rest no transmission can occur.

As forms of disorder in the nervous element we have first, increased vibratility; secondly, decreased vibratility; thirdly, increased, and fourthly, decreased, vibrations from abnormal degrees of peripheral impulse<sup>1</sup>; fifthly, abnormal routes of transmission may be taken, as in dreaming, in illusions or hallucinations; or sixthly, improper relations may occur, as when sensation, motion, and ideation are all

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<sup>1</sup> The vibratility remaining normal.

diminished, but the general heat of the body is increased (pyrexia).

The sensation which we know as pain, is doubtless the result of increased vibration of the painful parts; while in loss of sensation, which is its opposite, the vibration in the local neurine has correspondingly ceased.

Nerve-force or energy may be subdivided into the three forms of sensation, ideation, and motion, either one of these being convertible into either of the others, their difference being neither of kind nor of degree, but solely of conduction and distribution. If when asleep the foot is tickled, the impression is followed by motion only; if while awake, it is followed by sensation and motion, or inhibition. During sleep the ideational cells are inactive. If the impression be sufficiently powerful to overcome the inactivity, awakening takes place with the return of their activity.

The nervous system is liable to disorders commencing in its cell-elements (neoplasms and sclerosis); to disorders commencing in its vascular element (anæmia, hydræmia, hyperæmia, toxæmia); and to disorders of a dynamic (functional) character, the results of impressions made upon it at its periphery (in the various organs, stomach, liver, heart, lungs, ovaries, uterus, etc., etc.); or the result of waves of force originating in disturbance of cell-contents (neurine) of intrinsic character (some forms of insanity); or the result of waves of force arising from chemical decompositions extrinsic to the cells but in their immediate vicinity (alcoholism).

As the whole body, every part of it, is represented in the nervous centres; and as any disturbance of any part involves the disturbance of its representative portion in the nervous centres, it follows as a natural inference, that local disturbance of these centres themselves (primary) must be followed by a corresponding local disturbance at the periphery in the parts these centres represent.

These dynamic (functional) nervous disorders are among the hidden mysteries of medicine at present, whether they are sensory, ideational, or motor in their character (the term motor being used to include all efferent impulses, as of secretion or nutrition). The relations of the cerebro-spinal and the sympathetic systems of nerves to one another, and to the rest of the body, are by no means understood, although we know their activities take opposite directions, they themselves being analogous to the negative and positive conducting wires of the galvanic battery.

We only appear to have established that when the water of the body generally, in the blood, the cell-contents, and the intercellular fluids, is in excess, there is a corresponding tenuity of the neurine, a great mobility, and a greater tendency to disorder; while a good rich blood and a firm nutrition tend to promote a density of the neurine, give it greater stability, and prevent it from being violently disturbed (flying off the handle) at the slightest impression.

As examples of complex morbid conditions, those in which several elementary parts are primarily and simultaneously involved to produce the existence of such conditions, are inflammation and pyrexia or fever.

In inflammation there are two necessary results: 1st, an increased production of fibrin in the inflamed parts; 2dly, a state of general excitation, known as the sympathetic inflammatory fever.

In pyrexia there are a diminution of all sensory, ideational, and motor activities (languor and lassitude), and a simultaneous expenditure of the energy liberated during the processes of life by oxidation, etc., as increased body-temperature (heat), with a gradual reduction of the formation of fibrin in the body.

In both, great changes from the normal occur in the metamorphoses of the alkalies,—soda, potash, and ammonia,

—and of matters combined with them, as chlorine, sulphur, and phosphorus.

It is evident that these conditions, phlegmasia and pyrexia, must be estimated in the commencement of these processes, before those secondary changes are produced which are the results, the products of these conditions after they have been established.

The factors which constitute inflammation and fever must be estimated on the first, not the forty-first, day of the disease, if it last so long; not even on the second day of its duration. The supply of food is stopped from anorexia; the resources on hand become soon exhausted; the depurative processes become checked; the typhoid state is common in both, as the result of the anæmia and toxæmia thus produced; interstitial decay is soon commenced, and the union of Life and Matter is soon terminated.

This union of Life and Matter, the living state, must not be confounded with the activities of a body while living. The germ cell and the sperm cell are both individually alive, but they neither present any activity of a living body. If either were dead the germ cell could not be impregnated; but both being living, and becoming blended together in one, this one—now termed the embryo—commences to manifest the activities of a living body, and continues to do so as long as it continues to live; its activities consisting in the appropriation of external matter, and the conversion of this matter into its own substance; and in the decomposition of its own substance and of external matter, with reduction of these to more simple states of chemical composition, the liberation of combined energy, and the conversion of this energy into the energy needed for its own dynamic purposes of sensation, ideation, and motion.

A consideration of morbid processes from this standpoint, not only leads to greater diagnostic precision, but it also

tends to greater therapeutical precision, for the question naturally arises: If this or the other element of tissue is at fault, what agent will act on that element, and control its disorder, and lead it back to normal action?—and this leads back to a division of therapeutic means according to the element on which they act. A remedy which will control cell-activity, whether nutrient, secretory, or formative, will not necessarily act on the vascular or on the nervous element. A remedy which will act on the vascular element, whether augmenting or diminishing its volume, altering its composition, increasing its production, or hastening its depuration, modifying its distribution or the rate of its transmission, will not necessarily act on the action of structural cells, or on the manifestation of dynamic potencies. And in the same way, remedies which modify the correlations and distributions of energy will not necessarily influence the actions of cells, or the composition or the distribution of the blood.

Take, for instance, the actions of such remedies as iodine and mercury. In the case of neoplasms, syphilitic and scrofulous (*vide* Graves, "Clin. Lect."), the long-continued use of mercury in small doses will cause their disappearance. It seems to exert a specific influence on cell-action, and as a result its protracted use may cause cancrum oris, or caries of bones. In the same way I have myself seen, under the protracted use of iodine, the female mammæ disappear; and under the protracted use of iodide of potassium, one testicle disappear entirely and the other be diminished to the size of a large pea, about half an inch in diameter.

The remedies which act on the vascular element are numerous: alkalies and acids; digestives, as pepsin and pancreatin; depuratives, as purgatives and diuretics; diluents and nutrients,—all act on the vascular element and modify its composition.

The remedies which act on the nervous element primarily are about the most numerous in our *materia medica*. Some act directly on the nerve-tissue, as opium, Indian hemp, hyoscyamin, digitalis, etc., etc.; others act on the vaso-motor nerves, as amyl nitrite and the other nitrites, ergot, bromides, heat, cold, etc., etc. Mechanical means control the supply of blood, as compression; or removing atmospheric pressure, as Gunod's boot or the like.

When we inquire, On what element does any remedy act primarily? we shall find that we can refer its action to one of these three primary tissue-elements,—the cell, the fluid, and the nerve,—and if we can not so refer its action, its use is always doubtful; for the relation between the disease and the means of its cure must always be most intimate, and must be capable of being predicated to make the treatment of such disease rational.

## GUDDEN'S ATROPHY METHOD: AND A SUMMARY OF ITS RESULTS.

By E. C. SEGUIN, M.D.

MUCH as we honor the discoverer of a new fact of importance or of a series of facts, we owe much more to him who places at our disposal a new method, one sufficiently tried to merit adoption at our hands. A method is a chapter of applied logic, pregnant with possible results of unknown importance. And this is not its only value, for, as a part of the logic of science, it also serves a purpose in scientific speculation, and almost inevitably gives rise to new ideas, to other methods, by analogy or by deduction.

Gudden's atrophy method, one of the anatomical methods applied to the study of that obscure field of research—the central nervous system,—lay hidden, most unfortunately, in the possession of its originator and a few pupils, for nearly thirty years, and even since its publication in 1872, it has been but little noticed outside of a very small circle of neurologists.<sup>1</sup> Yet, I think that the following abstract will show it to be one of the most important and promising of the various special anatomical methods.<sup>2</sup>

From 1850 to 1852 Augustus Waller was at work in Budge's laboratory at Bonn, perfecting his method of studying the degeneration of severed nerves. The facts of degeneration and regeneration after nerve-section had been long known, but it remained for Waller to formulate the

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<sup>1</sup> In the most recent scientific work on anatomy (Burt G. Wilder and Gage, "Anatomical Technology," New York, 1882), containing a remarkably full bibliographical index, the name of Gudden does not appear.

<sup>2</sup> The special anatomical methods applied to the study of the central nervous

law under which the degenerative process occurs. In his "*Nouvelle méthode anatomique*," Bonn, 1852, he gave a full summary of the facts and laws he had discovered, and they have been common property ever since, leading to numerous important anatomical and pathological discoveries. The doctrine of the Wallerian degeneration, has, I may say, been a valuable instrument in our hands for thirty years.

At the very same time, 1849, Gudden, a recent graduate of the University of Berlin, then assistant physician in the Siegburg insane asylum under the celebrated Jacobi, was experimenting upon the brains of animals in a different, yet correlative, manner. He had already extirpated eyes of rabbits, and noted the atrophy of the intracranial optic apparatus; he already knew the tractus peduncularis transversus, and many of his subsequent discoveries were half developed.<sup>1</sup> This was done in ignorance of Waller's work, and partly before it; certainly long before Türck's publications on secondary degenerations.

For reasons best known to himself, Professor von Gudden did not publish an account of his method until 1870,<sup>2</sup> although his principal facts and laws had long been known to him, and he had communicated freely with friends and assistants, so that we have here a striking example of the simultaneous discovery of facts, laws, and methods which, applied to the same division of the animal frame, are in themselves not very unlike, and in their results are logically united, and, indeed, complementary to each other.

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system are: (a), The dissociation or dissection of fasciculi in partially hardened specimens, as practised by older anatomists, by Foville, Gratiolet, Broadbent, and many others (nearly disused); (b), the Rolando-Stilling method of series of fine sections of the hardened organs; (c), the Wallerian degeneration in animals; (d), the Türck secondary degenerations in man (and in animals); (e), Flechsig's method of determining the period at which certain systems of fibres in the foetus acquire myelin.

<sup>1</sup> Oral communication from Prof. v. Gudden, August 4, 1883.

<sup>2</sup> Experimentaluntersuchungen über das peripherische und centrale Nervensystem. *Wesphal's Archiv*, Bd. ii, p. 693.

I purpose in the following pages to enunciate the central principle of Gudden's method, and then to analyze his publications and those of his pupils, more or less in chronological order with reference to publication. Besides consulting these publications, I have had the advantages of conversing with Prof. Gudden and several of his pupils, and of examining the specimens proving the statements advanced in nearly every case.

PRINCIPLE: *That by experimenting on newly-born animals, especially those which, like the rabbit, are brought forth in a somewhat fœtal state, complete atrophy of the central connections of a nerve-trunk, or a nerve-fasciculus, or a nerve-centre, is obtained by operation. The central (proximal) fibres and cells are destroyed, while the peripheral fibres, if any, undergo the Wallerian degeneration.*

There are several secondary advantages in using very young animals; they (rabbits at least) have almost no hair; they suffer but little pain, and scarcely struggle under the knife; they bear the shock of incision and removal of important parts of the central nervous system wonderfully well; hæmostasis is in them very rapid and definite, and the process of repair simple.

For operations on nerve-trunks, almost any animal can be used. For experiments on intracranial parts, dogs are objectionable because of their hard craniums; kittens are intermediate between rabbits and dogs in this respect, but they are liable to suppuration, and the mother is apt to interfere with the sutures.

Most operations should be done on the second or third day of life, but may succeed later; still, the older the animal the more the Wallerian law of degeneration in one direction (centrifugal from centre) only prevails.

For most operations on the olfactory apparatus it is

necessary to wait until the animal (rabbit) be six or seven days old, in order to give time for the ears (hearing and tactile sense) to develop sufficiently to enable the creature to guide itself and find the mother.

For operations on the hypoglossal and vagus nerves one must wait still longer, from the second to the sixth week.<sup>1</sup>

The various operative procedures will be described under the several heads of this review, but it is well to state here that the lesion should be a *destructive* one; the olfactory lobe or eyeball must be removed, or in the case of nerves, their central ends after section must be pulled out of their bony canals with good forceps. In the case of nerves in newly-born animals, so much comes away by this method that there is reason to believe that some axis-cylinders are broken off deep in the nervous centre from which they spring.

It is possible that some of Gudden's operations give results as much by degeneration as by simple atrophy; in other words, that his and Waller's method overlap each other. In this connection let me say that the histology of the early period of Gudden's atrophy is unknown, which is a deplorable hiatus in our knowledge. From a study of this point we may learn something of the obscure point referred to, viz., the true relation between the two methods, and obtain new light on so-called "trophic" laws of the nervous system.

The operated animals are left to the mother's care, and allowed to grow from six to twelve weeks; the former period being quite sufficient for most experiments. Indeed, Gudden has shown<sup>2</sup> that after removal of one eyeball in dogs one day old, distinct atrophy of the optic nerve was

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<sup>1</sup> Oral communication from Prof. v. Gudden.

<sup>2</sup> *Archiv f. Ophthalmologie*, Bd. xxv, Heft 4, pp. 237-246, 1879.

visible on the 8th, 14th, and 28th days. In rabbits a distinct atrophy may be visible in 36 hours after operation on second day.<sup>1</sup>

During this period of preservation, the animals should be carefully studied as to their functions, with especial reference to the injured apparatus, and compensatory functions. By doing this in as careful a manner as Munk has done for his cortex experiments, some physiological and psychological knowledge might be gained from each series of operations. This has been done, but not as fully or exactly as should be.

After the animals are sacrificed, the affected parts should be carefully examined for asymmetry, change in color and consistence. If possible, photographs of the fresh specimens should be taken, and careful measurements of parts made. The organs are then placed in a solution of bichromate of potassium, or of osmic acid, for hardening. When this is complete the various sections necessary to reveal the direction and extent of central changes are made and preserved in accordance with well-known methods. It is often desirable to have complete series of sections through the whole organ or a portion of it, so as to enable the exact extent and distribution of the atrophy to be followed. In such cases the use of Gudden's microtome is necessary. The sections should be thin enough to allow of their examination by  $\frac{1}{4}$  or  $\frac{1}{8}$  inch objectives. Usually trans-sections show the lesion well, but in some cases (olfactory part of anterior commissure) longitudinal dextro-sinistral sections are necessary.

The condition of the atrophied centres may be roughly stated as follows: As an example, after extraction of the facial nerve, a series of trans-sections of the medulla show simply an absence, a total absence, of the injured nerve-

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<sup>1</sup> *Ibidem*, Bd. xxv, Heft 1, pp. 1-56.

trunk in its course through the medulla, and of its nucleus of origin. There is, architecturally speaking, a virtual void in this region, which is filled up or compensated to a degree by the ingrowth and overcrowding of adjacent normal parts. There are no exudations, thickening of neuroglia, areas of disintegration, etc., so that the topographical study of the sections and the tracing out of the atrophy are not hindered as in ordinary pathological specimens.

#### RESULTS OBTAINED BY GUDDEN'S METHOD.

I propose mentioning these very briefly and without criticism. Many of the questions to which the experiments relate are novel and intricate; further researches by other methods may modify the views held by Gudden and his pupils, but these views should be plainly stated so as to serve as data for other observers. Enough will be found in this abstract to justify, I think, the statement that we already owe much in anatomy and physiology to this method, and that it offers great possibilities for the future.

The topics will be considered partially in chronological order.

#### *I.—Composition and connections of the commissura anterior cerebri.*

Von Gudden and Ganser have been able to resolve these two questions in greater part by the atrophy method. It has long been known that the C. A. consists of two unequal fasciculi, variable in different animals, and these Ganser calls (1) pars temporalis; (2) pars olfactoria. In general terms, as revealed in normal sections, the p. t. is very much larger in man and in monkeys, while in lower mammals, particularly the hedgehog, mole, and rabbit, the p. o. is highly developed and larger than the p. t.

1. Pars temporalis. Von Gudden, in 1870,<sup>1</sup> published experiments illustrating the nature of the pars temporalis.

EXPT.—In a newly-born rabbit the whole upper part of one cerebral hemisphere was excised, above the basal ganglia. Autopsy at eight weeks showed the commissura anterior normal.

EXPT.—In another rabbit the whole of one hemisphere was removed. Seven weeks later the animal was killed, and sections of the (hardened) brain showed complete atrophy of the commissura anterior. The external capsule was, however, preserved in the remaining hemisphere.

In both experiments there was atrophy of the corpus callosum, complete in the latter.

Conclusions: the temporal division of the C. A. is a true commissure, as is also the corpus callosum.

The external capsule has no direct connection with the C. A.

These experimental results have been confirmed by Ganser. The conclusions are, moreover, supported and extended by the result of the careful study of complete series of brain sections of man, monkey, and lower mammals, made by Ganser.<sup>2</sup> The sections were transverse and horizontal, and in them the course of the C. A. (its pars temporalis) was always distinctly into the temporal lobe, beyond the nucleus amygdalus. No fasciculi going to other parts of brain (occipital lobes, Meynert et al.) could be discovered.

2. Pars olfactoria. Von Gudden experimented on this also, but his conclusions were invalidated by a source of error discovered later on. It is to Ganser (op. cit.) that we owe the absolute demonstration of its true nature and distribution by means of von Gudden's method.

<sup>1</sup> Experimentaluntersuchungen über das peripherische und centrale Nervensystem. *Westphal's Archiv*, Bd. ii, p. 693, experiments v and vi.

<sup>2</sup> S. Ganser: Ueber die vordere Commissur der Säugethiere. *Westphal's Archiv*, Bd. ix, Heft 2, 1878.

EXPT.—The brain of two rabbits formerly operated by von Gudden were cut into complete series of horizontal and transverse sections. The injury consisted in destruction of the left tractus olfactorius and frontal part of lobus pyriformis with a portion of adjacent (dorsal) frontal lobe. The left bulbus olfactorius (lobus olf.) was very much atrophied. In both sets of sections (the horizontal best adapted) there was complete absence of the olfactory division of the C. A.

EXPT.—Two other rabbits from whom von Gudden had removed one of the bulbi olfactorii. These brains were shrunken and overhardened, yet fairly good sections were obtained, enough to show that in these two cases also there was complete atrophy of the p. ol. of the C. A.

Conclusions: the pars olfactoria of the C. A. is also a true commissure, and unites the two bulbi olfactorii.

Thus, by a few simple experiments and careful observations (objectively carried out) of preparations, is that fanciful fabric, Meynert's olfactory chiasma overturned.

## II.—*Commissura inferior cerebri.*

Almost from his earliest experiments on the optic apparatus, von Gudden had observed that after removal of both eyeballs, a portion of the chiasma and of the optic tracts did not undergo atrophy. In his first published accounts<sup>1</sup> of the structure of the optic nerves, etc., he formulated this observation by naming the surviving or non-atrophied nervous band, commissura inferior cerebri, and expressed the opinion that it was a commissure between the thalami. In the first of his series of contributions<sup>2</sup> in *Græfe's Archiv*, these preliminary demonstrations are repeated. In the third contribution,<sup>3</sup> in reply to certain statements of Michel,

<sup>1</sup> Experimentaluntersuchungen über das peripherische und centrale Nerven-system. *Westphal's Archiv*, Bd. ii, p. 693 (1870).

Sitzung der viii Versammlung der Schweitzerischen Irrenärzte (Sept., 1872), abstract in *Psychiatrische Zeitschrift*, Bd. xxx, p. 135.

<sup>2</sup> Ueber die Kreuzung der Fasern im Chiasma Nervorum Opticorum. *Archiv f. Ophthalmologie*, Bd. xx, Heft 2, pp. 249-268, 1874.

The second contribution is in Bd. xxi, Heft 3, pp. 199-205, 1875.

<sup>3</sup> *Idem*, Bd. xxv, Heft 1, pp. 1-56, 1879.

he insists upon the distinction between this fasciculus and the one known as Meynert's commissure, which is distinctly dorsal of the chiasma, and separated from it. The commissura inferior, on the contrary, is mingled with the tractus opticus and can only be discerned by excluding the fibres of the latter, which is easily done by removal of both eyeballs in the young animals, thus producing atrophy of all the truly optic fasciculi.

Sometimes in the rabbit, dog, and cat, a slight depression in the caudal-ventral aspect of the chiasm suggests its limits.

In trans-sections of rabbits' tractus opticus no special limit is discernible; but it is noticed that while the optic fibres are coarse, those of the C. I. are fine. If one of these trans-sections be treated with alcohol and then with carmine the portion belonging to the C. I. is strongly tinged, while the optic fibres remain white. The same reaction has been obtained by Mayser in the T. O. of cyprinoid fishes. In dogs, cats, monkeys, and man no such chemical distinction exists. If the sections of rabbits' T. O. are placed unstained (only colored by potassium bichromate) in glycerine, the fibres of the C. I. appear as forming a clearer mass in the dark field of the optic fibres.

In his fourth optic contribution,<sup>1</sup> von Gudden describes the appearance of the optic apparatus in a human case of long-standing one-sided blindness. Those parts in the chiasma and tractus optici which correspond to the C. I. he found unchanged, but not distinctly limited, and made up of fibres having the same diameter as the optic fibres. The C. I. in these trans-sections was dorsal of the optic fibres. In the chiasma of animals it occupies the caudal, or the caudal-ventral, aspect.

In his "Experimentaluntersuchungen," he states, that

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<sup>1</sup> *Archiv f. Ophthalm.*, Bd. xxv, Heft 4, pp. 237-246, 1879.

the study of numerous trans-sections of the brain has shown that the commissura inferior extends into the thalami optici, connects them, and is probably in no wise associated with the optic apparatus. After destruction of the lobus opticus and the corpus geniculatum laterale, the commissura inferior remains unchanged.

In connection with these important studies upon the commissural systems of the brain (corpus callosum, commissura anterior, and commissura inferior) von Gudden has formulated the following law of atrophy (of nutrition):

That a true commissure, separated from one of its attachments, must undergo bilateral atrophy.

### *III.—Distribution of fibres in the optic apparatus.*

As stated in the four articles in *Græfe's Archiv*, von Gudden has reached the following conclusions:

1. That in birds there is complete decussation of fibres in the optic chiasma.

EXPT.—Removal of one eyeball in a pigeon immediately after birth. Autopsy in eight weeks showed atrophy of optic nerve of same side, extending across the woven chiasm to the opposite optic lobe, which is much reduced in size.

2. In the higher mammalia the decussation is variable, but is always a semi-decussation.

EXPT.—In a rabbit,<sup>1</sup> the right eyeball was enucleated. Results: (a) atrophy of right optic nerve; (b) chiasma unchanged; (c) opposite (left) tractus opticus swollen, as are also (d) the lobus opticus, and (e) the corpus geniculatum laterale; (f) complete atrophy of opposite left tractus peduncularis. Negative results: post-optic lobes (corpus quadrigeminum inf.) and commissura inferior normal.

This experiment seemed to show that there was complete

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<sup>1</sup> It was always in newly-born animals that the various operations were done.

decussation in the rabbit, and so Gudden held for some years, but different experiments, published in 1879,<sup>1</sup> demonstrated beyond question the existence of a direct fasciculus in the optic nerve of this animal.

EXPT.—By means of a sharp spoon, the optic lobe, corpus geniculatum externum, subjacent part of caudex, and corresponding optic tract are removed. Autopsy at age of six months. Results: (a) total atrophy of injured tractus opticus; (b) opposite optic nerve atrophies in greater part, but still showing a small normal white fasciculus.

EXPT.—The brain was lifted up, and one half of chiasm cut out with a sharp spoon. Results: complete atrophy of the optic fibres, except a small (lateral) bundle in opposite optic nerve—its direct fasciculus—(in this experiment the commissura inferior undergoes atrophy, as does also Meynert's commissure dorsal of tractus).

As complementary to these results may be added the fact that one of Gudden's assistants, Dr. Bumm,<sup>2</sup> carefully examined the retina of the eye receiving only the direct fasciculus, and found the nerve-fibre layer atrophied, except in the lateral (temporal) segment of the organ. The retina was hardened in osmic acid, and the whole of it cut and prepared.

Consequently, it must be held as demonstrated that in rabbits there is semi-decussation, but to a slight degree only, as the crossed fasciculus is enormously larger than the direct; and that this small direct fasciculus supplies the temporal part of the retina in dogs.

EXPT.—Right eyeball enucleated. Results: (a) complete atrophy of right optic nerve; (b) both optic tracts reduced in size, the left smaller; (c) both optic lobes smaller; (d) both corpora geniculata laterala smaller; (e) caudal cords of thalami smaller; (f) tractus peduncularis smaller. The commissura inferior was preserved.

EXPT.—“Optic centres” (lobus opticus and corpus genicu-

<sup>1</sup> *Arch. f. Ophthalm.*, Bd. xxv, 1, pp. 1-56, 1879.

<sup>2</sup> Bumm: Ueber die Vertheilung des Sehnerven in der Netzhaut des Kaninchens. *Westphal's Archiv*, Bd. xi, p. 264, 1881.

latum laterale) removed on right side. Results : (a) tractus opticus of same side atrophied ; (b) both optic nerves reduced in size, opposite (left) smaller ; (c) commissura inferior preserved.

In dogs, consequently, there is also semi-decussation, to a greater extent than in rabbits, but still the direct fasciculus is smaller than the crossed.

The course of the direct fasciculus in the dog (as seen in horizontal sections of chiasm from above experiment), lies in the dorsal border of right tractus opticus ; reaching the chiasm it passes over the crossed fasciculus from the other tractus, and then from the medial border of the optic nerve on same side (right). In rabbits this fasciculus lies in the lateral border of optic nerve.

Numerous experiments of these kinds are recorded in the various papers, and elaborate measurements given of the areas of the affected optic nerves and tracts.

Gudden formulates the law of atrophy in the optic apparatus as follows :

1. The optic nerves and tracts degenerate (undergo atrophy) when the retina is destroyed (removed).
2. The "optic centres" (lobus opticus and corpus geniculatum laterale) also undergo atrophy in such a case.
3. When the centres are removed, the degeneration does not involve the retina.

In man, reasoning by analogy from the higher mammals experimented on it, would seem that semi-decussation were a logical necessity, yet several advocates of complete decussation have appeared.<sup>1</sup> These arguments have, however, been very weak, and Gudden made short work of their few experimental claims.<sup>2</sup> Cases of long-standing monocular blindness in man, fitted for the direct solution of the problem, are not infrequent, but few of them have been properly

<sup>1</sup> Chiefly Michel, *Arch. f. Ophthalm.*, Bd. xxiii, Heft 2, pp. 213-226, 1877.

<sup>2</sup> *Arch. f. Ophthalm.*, Bd. xxv, Heft 1, pp. 1-56, 1879.

studied. Von Gudden has had the opportunity of examining four such cases.

CASE 1.—Man eighty-five years old; blind in one eye from early youth: phthisis bulbi. The atrophy is not total, many normal nerve-fibres being found in affected optic nerve. Both tractus smaller than normal.

CASE 2.—Man thirty years old; complete atrophy of left optic nerve (not one fibre found in a careful microscopic examination); both tractus reduced in size, one on opposite side smaller.

CASE 3.—Male, dying at sixty, with left hemiplegia. Thirteen years previously had had an attack of "apoplexy." Besides the lesion in one internal capsule explaining the hemiparesis, there was found an old hemorrhage which had destroyed the left corpus geniculatum laterale, part of the thalamus opticus, and part of the tractus opticus. The whole tractus was atrophied; the opposite optic nerve smaller, and the nerve on same side contained many atrophied fibres, and was smaller (on section) in its medial and central fasciculi. (The case is obscurely reported, and there seems to be an error in the designation of the optic nerves.)

CASE 4.<sup>1</sup>—Woman, aged seventy-three years. Glaucoma and complete loss of sight in right eye for four years. The right optic nerve was completely atrophied; the right tractus opticus seemed normal to naked eye; the left tractus was smaller and mostly gray; on the chiasma itself, and upon the left tractus, crossing chiasm from the frontal medial border of left optic nerve, was a projecting white band, the direct fasciculus from left eye. The microscope showed the left tractus all gray except in its dorsal aspect, where some normal nerve-fibres were seen; the right tractus, on the other hand, presented (in sections) only a small area of atrophied fibres (the direct fasciculus from the right eye, and the commissura inferior). The degeneration and atrophy extend to the optic centres, *i. e.*, the left corpus geniculatum laterale and lobus opticus.

These cases certainly favor the theory of semi-decussation.

The following is a general summary of von Gudden's results with respect to the optic apparatus.

1. That Johannes Müller's law (which was only a physiological postulate), that in animals whose visual axes are

<sup>1</sup> *Arch. f. Ophthalm.*, Bd. xxv, Heft 4, pp. 237-246, 1879.

only lateral (monocular vision) there is total decussation, and that in animals whose visual axes are more or less directed forward (more or less perfect binocular vision) there is semi-decussation, is a good law, supported by his (Gudden's) experiments and other facts.

2. That there is no anterior commissural (inter-retinal) fasciculus in the optic apparatus.

3. That the posterior commissural fasciculus of classic authors is his commissura inferior, which has no relation to the optic system.

4. That the optic system in mammals consists only of two bundles or fasciculi, one crossed and the other direct; the former the larger in rabbits, dogs, and cats (and quite certainly in man).

5. That there is an accessory optic fasciculus, whose central and peripheral terminations are yet unknown, viz., the tractus peduncularis transversus.

6. That each optic tract is composed of three sorts of fibres, of the same size in man, of different sizes and different carmine reaction in animals; optic fibres (crossed and direct), fibres of the commissura inferior, and "hemispheric fibres," whose course is not well known. These last-named fibres are in the most lateral part of the tractus and pass into the crus cerebri.

These results were confirmed by the experiments of von Gudden's pupil—Ganser—on cats, published last year.<sup>1</sup> This able observer has also carried the inquiry further, as regards the cortical and retinal distribution of optic fibres, affording a remarkable concurrence between von Gudden's results and Munk's.

Ganser chose cats, for several reasons. They are vigorous under operative interference; they are more intelligent

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<sup>1</sup> Ueber die periphere und centrale Anordnung der Sehnervenfasern und über das Corpus bigeminum anterius, *Westphal's Archiv*, Bd. xiii, Heft 2, 1882.

than rabbits, so that one can test their visual field; they have, to a remarkable degree, binocular vision, and thus resemble man; their retina has a very high and clearly defined structure, thus affording excellent opportunity for ophthalmoscopic and microscopic study.

He relates three crucial experiments as follows:

EXPT. 1.—For the determination of the direct fasciculus. On the third day after birth, the left eyeball of a kitten was enucleated. A fine forceps was introduced through the foramen opticorum, and the tractus opticus of the same side torn or cut (at the same time unintentionally a slight wound was made in the infundibulum and left internal capsule). Cat recovered quickly and grew normally; was, however, lazy or stupid, more so than a brother kitten who had lost one hemisphere. Vision seemed good till tested, when it was found it had hemianopsia, *i. e.*, was using only the temporal half of its remaining retina. Autopsy at nine months. The only part of optic apparatus left was a white nerve extending from right eyeball to the optic centres of same side; no chiasm. Right optic lobe and corpus geniculatum laterale larger. The right tractus peduncularis transversus was smaller than normal, the left almost invisible; commissura inferior absent. Sections of the hardened retina showed normal nerve-fibres (amyelinic in cat), only in its temporal two thirds; on nasal side fibres and ganglionic bodies atrophied.

Conclusion: there is a true fasciculus lateralis (or direct fasciculus) in the optic system of the cat, and it supplies the temporal part of the retina.

EXPT. 2.—To determine the relation between the occipital cortex and the optic apparatus.

In a kitten of same litter a portion of the left occipital lobe was removed without wounding the cornu ammonis or the basal ganglia. The injury was smaller but similar in location to that done to a dog's brain by von Gudden.<sup>1</sup> This cat had no symptoms, but special tests (by means of a white ball swung around the cat in direct and inverse directions) revealed right homonymous hemianopsia. Ophthalmoscopic examination showed

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<sup>1</sup> *Archiv f. Ophthalm.*, Bd. xxi, Heft 3, pp. 199-205, 1875.

morbid changes in the temporal two fifths of the left retina, and in the right eye more than the medial (nasal) half was atrophied. Autopsy at nine months. Left hemisphere shows scar opening freely into lateral ventricle (no inflammatory action). Left tractus opticus smaller than right, revealing more of Meynert's commissure on the crus. The optic nerves seemed little, if at all, changed to the naked eye, but on measuring the area of sections under the microscope, the right nerve-sections were found smaller.

Microscopic examination of the hardened retinae showed no local elemental atrophy, but there was distinct thinning of the retina in both left halves (left temporal and right nasal halves), especially distinct in the papillæ.

EXPT. 3.—For the same purpose. In a third kitten the left hemisphere of the cerebrum was nearly all removed, the corpus callosum and fornix being carefully cut in the medial line. The animal grew well and was not at all paralyzed. The only movement which he learned late was springing up on a chair, etc. Was dull and had a bad memory. Tactile sensibility and reflex movements seemed normal, but pricking was but little felt over whole body. As in the former cat, there was right homonymous hemianopsia. Ophthalmoscope showed the temporal part of retina atrophied in left eye, while in the right the morbid changes extended over two thirds of the retina (more than nasal half). Autopsy at six months. Large serous sac in left brain; olfactory bulb and lobe, base of temporal lobe, and basal ganglia uninjured; left thalamus smaller; internal capsule atrophied; left half of pons, and left crus cerebri smaller; left anterior pyramid absent; left optic centres (optic lobe and corpus genic. laterale) are smaller. Both tractus optici smaller than those of normal kittens of same age; left more reduced. Under microscope the section-areas of both optic nerves diminished, right more. Sections of hardened retinae showed, as in former case, a thinning of retinal layers in both left halves—left temporal and right nasal segments.

Conclusions: In cats the crossed fasciculus is larger than the direct. In cats there is an anatomical connection between the hemispheres (visual area in occipital lobe) and the optic centres, extending thence to the retinae.

Gudden's old experiment,<sup>1</sup> showing that in rabbits re-

<sup>1</sup> *Experimentaluntersuchungen, etc. Westphal's Archiv, Bd. ii, p. 693, 1870.*

removal of one hemisphere has no influence on optic nerves, was repeated with the same results in six young rabbits.

It would thus appear that in lower mammals (those with insignificant binocular vision) the optic-nerve fibres are chiefly collected in the optic centres (optic lobe and corpus geniculatum laterale), while in higher mammals, dogs, cats, monkeys, as in man, there is a large, better differentiated cortical connection.

The new and most interesting question of the anatomical relation existing between the layers of the optic lobes and the peripheral optic apparatus on the one hand, and the visual area of the cortex cerebri on the other hand, was studied in the rat as follows :

EXPT. A.—White rat three days old. Right eye enucleated. Autopsy at nine months. Right optic nerve atrophied ; left tractus much smaller than right ; left optic lobe and corpus geniculatum laterale flatter and smaller.

EXPT. B.—White rat three days old ; removal of convex part of right cerebral hemisphere (part of cornu ammonis also removed). Autopsy in nine months. Both optic nerves alike ; right thalamus, optic lobe, and corpus geniculatum a little smaller. Right internal capsule atrophied, crus cerebri smaller, anterior pyramid absent.

The brains were subdivided into segments and hardened in a two-per-cent solution of osmic acid (24 hours), and later in alcohol. The optic lobes were cut into fine trans-sections, which were carefully examined.<sup>1</sup>

In rat A there was a reduction of the left superficial gray, and nearly total atrophy of the superficial white (*fibre visiva* of Tartuferi<sup>2</sup>); intermediate white normal on both sides. [Effects—one-sided in rat because of insignificance of direct fasciculus.]

In rat B, on the right side, the intermediate white was reduced, and there was also partial atrophy of the right side of the tubular gray (from what cause?).

<sup>1</sup> In the normal optic lobe Ganser distinguishes the following layers : 1. zonal fibres (present only in higher mammals) ; 2. superficial gray ; 3. superficial white ; 4. intermediate gray ; 5. intermediate white ; 6. deep-seated white ; and 7. the tubular gray.—Ganser: Vergleichend-anatomische Studien über das Gehirn der Maulwürfe. *Morphol. Jahrbuch*, Bd. vii, p. 711.

<sup>2</sup> *Fibre di origine del tratto ottico* in the *strato bianco-cinereo superficiale* of

Conclusions: In rats the peripheral optic apparatus is more intimately connected with the superficial gray and white layers of the optic lobes, while the visual area of the cerebrum is mostly in relation with the intermediate white layer.

It may not be wholly superfluous to add that an important negative conclusion from the work of von Gudden and his pupils is, that neither the post-optic lobes (corpora quadrigemina inferior) nor the corpora geniculata medialis are connected with the optic apparatus; a view which is borne out by morphological conditions, etc.

#### IV.—*Tractus peduncularis transversus.*

When von Gudden published his first account<sup>1</sup> of this interesting fasciculus he was unaware that it had long been known; but he himself rectified his error by giving a bibliographical account of it along with his later experiments.<sup>2</sup> The bundle was unknown to most of the older anatomists, but Gall and Spurzheim<sup>3</sup> described and figured it in several plates as early as 1810. Von Gudden knew it (in connection with his first optic experiments) as early as 1849. In Leuret and Gratiolet's atlas<sup>4</sup> it is drawn by the artist but not referred to by the author (Gratiolet). An Italian investigator appears to have described it in 1861, under the name of *fascio transverso*.<sup>5</sup>

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Tartuferi. (Sull' anatomia minuta dell' eminenze bigemine anteriori delle scimmie. *Rivista Sperimentale di Freniatria*, v, F. iii, 1879.

<sup>1</sup> Ueber einen bisher nichtbeschriebenen Nervenfaserung im Gehirn der Säugthiere und das Menschen. *Westphal's Archiv*, Bd. ii, p. 364,—1870.

<sup>2</sup> Ueber den tractus peduncularis transversus. *Westphal's Archiv*, Bd. xi, Heft 2, 1880.

<sup>3</sup> "Atlas d'anatomie et de physiologie du système nerveux en général et du cerveau en particulier." Paris, 1810.

<sup>4</sup> "Anatomie comparée du système nerveux." Paris, 1857.

<sup>5</sup> A proposal has recently been made by a distinguished American zoölogist, Wilder, "Anatomical Technology," New York (1882), to change this name to *cimbria*. This term has no anatomical sense whatever its architectural value may be. Von Gudden's name, on the contrary, if long, is descriptive and

As its name correctly implies the tractus ped. trans. traverses the crus cerebri (peduncularis). It apparently arises from just within the medial border of the crus, passes over it in a line about half-way between the caudal edge of the tractus opticus (and Meynert's commissure) and the frontal border of the pons, extending lateral and dorsal to the frontal edge of the lobus opticus where it disappears. The tractus ped. tr. is thus distinctly traceable only in the lower mammalia; in man it is but slightly visible in a part of its course.<sup>1</sup>

Von Gudden has endeavored, but thus far in vain, to determine the true origin and destination of this fasciculus. As regards its function he long ago learned something from his various extirpation experiments on the optic apparatus. The facts have already been incidentally stated, but a more direct quotation is permissible.

EXPT.—Extirpation of both eyes in rabbit. Results: atrophy of optic nerves, of optic part of chiasm and tractus optici, of primary optic centres, *and of both tractus pedunc. tr.*

EXPT.—Extirpation of one eyeball in rabbit. Results: atrophy of optic nerve, of opposite optic tract (very slight of tract of same side), of primary optic centres of opposite side, *and of tractus pedunc. tr. of opposite side.*

EXPT.—In the dog after enucleation of one eyeball there are: atrophy of optic nerve, of both optic tracts, and both sets of primary optic centres, *and of both tractus pedunc. tr.* In all the parts caudad of chiasm the atrophy is more marked on the side opposite the enucleation.

EXPT.—Excision of part of occipital lobe in a dog, and removal of one optic lobe in a rabbit, were followed, among other results, by reduction in size of the corresponding tractus pedunc. tr.

Conclusions: The tractus peduncularis transversus has a  
equivalent to a definition—consequently it is good and should be retained. From the context in Wilder, *op. cit.*, § 1203, p. 475, it seems that he does not know Gudden's now old discovery of the optic nature of this fasciculus.

<sup>1</sup> Cf. Schwalbe: "Lehrbuch der Neurologie," p. 459. Erlangen, 1881.

functional and anatomical connection with the optic apparatus—more with its peripheral part, to which it stands in the same relation as the crossed fasciculus of the tractus opticus. Its connection with the primary optic centres is direct, but less intimate; its connection with the visual area of the cerebral cortex is still less marked, but also direct.

## OSTEITIS DEFORMANS.

By S. J. WIGHTMAN, M.D.,

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Samuel Lappey, æt. twenty years, laborer, was born in Pennsylvania. Came under my care on the 26th of August, 1878, suffering from what I supposed at the time to be chronic articular rheumatism. A few years previous to this time he had fallen from a building thirty feet high, lighting upon a pile of bricks, injuring, as was supposed at the time, only his feet. A few weeks afterward his limbs became painful, his feet twisting upon the ankles and causing an excruciating pain, as of rheumatism, for which disease he was treated. Pressure aggravated, and quiet relieved, the pain. While sitting or lying upon the bed he experienced great comfort, that is to say, the pain was not so great, although he never was for a moment free from it. But standing or walking about, especially when the muscles were called into action, he suffered increased pain. His mother died in childbirth, from what was reported "inflammation of the bowels," most probably perimetritis; otherwise his family history was good, as a conversation with several members of it could not elicit any hereditary taint. He was six feet high, and on the whole had a powerful frame; was intemperate and careless about his person.

The symptoms, when first seen by me, were pain in the limbs, hip, and back; enlarged knee-joint, which was tender but not swollen or attended with heat; ankles enlarged, and the foot apparently subluxated; waddled in his walk—that is, his gait was uneven: shoulders thrown back; his arms swung loose about his person; urine high-colored, with deposits of uric acid; the pulse 82, full and strong; temperature normal, tongue pale, furred, and partially coated; bowels regular; appetite good.

Diagnostic points between osteitis and synovitis were: Pain was felt before swelling, in this case; with or after the swelling, in synovitis. The pain is subject to variations in osteitis, and constant

in synovitis. The most important symptom in this case was the relief that attended the reclining position, and the *apyretic* condition. In articular rheumatism, too, rest will relieve, but it is attended with swollen joints and fever.

When I first examined this patient, I was, like those before me, led into the belief, on account of this peculiar pain, that it was "chronic articular rheumatism," and gave him Dover's powders and nitrate of potassium, but with no good results. He complained of insomnia, and I prescribed morphia, which only aggravated the pain. I blistered the parts, which only gave relief as long as the surface remained broken. I then ordered iodide of potassium and wine of colchicum, but obtained no change for the better.

About six weeks from the time he was first seen I noticed two hard growths, one over the liver and one over the spleen. They appeared simultaneously and were attended with very little pain. Believing he had a congested liver and spleen I prescribed for him moderate doses of calomel for the purpose of gaining an absorbent effect. The tumors continued to enlarge although I had endeavored in various ways to destroy them.

About four weeks after they were first seen, it appeared as if there was one tumor divided into two parts, about on a line with the linea alba; and on examination by palpation, I obtained a distinct fluctuation. Thinking now, as no jaundice attended, that he was suffering from an encysted tumor I deemed it necessary to call several physicians in consultation, who, after a most careful examination, agreed that fluid was encased within the walls of the abdomen, and recommended puncturing with the trocar and caula. The operation settled the diagnosis, as nothing but a tuberculous matter followed the removal of the instrument, and the microscope gave us evidences of cancer.

I now placed him on a supporting treatment, and endeavored to alleviate his sufferings as much as possible. The tumor continued to increase in size, filling the entire abdominal cavity, and finally pressing upon the heart and lungs. He died on the 11th of January, 1879.

A post-mortem examination was held between the hours of one and four P.M., on the 12th, by myself and Drs. Asdale, Estep, and Barton, and gave the following:

He measured 50 inches around the waist. His maximum length was  $76\frac{1}{2}$  inches, his minimum length was  $74\frac{1}{2}$ . The right tibia

17 inches; left tibia 16 inches. Right femur  $22\frac{3}{4}$  inches, left femur  $23\frac{1}{4}$ . The pelvis was deformed, thus accounting for a variation in the length of the man. There was a spongy enlargement of the knee-joints. The joints were opened and accurate measurements made.

The vertebral bodies were enlarged and apparently spongy. The transverse and spinous processes were elongated; one of them, the seventh cervical, was fully three inches long.

The abdomen was opened from the ensiform appendix to the symphysis pubis, and along the line of Poupart's ligament from the symphysis pubis to the anterior spine of the ilium. The peritoneal cavity was completely filled with the tumor, which was discovered to be a cancer of the omentum, and was divided apparently into two parts by the foramen of Winslow. The intestines were pressed from their position; the vermiform appendix and cæcum occupying a position on a line with the linea alba, about one inch below the umbilicus. The ascending colon from this point took a direction upward to about four inches above the umbilicus, where it joined the transverse portion, which dipped directly downward to a point about opposite the eleventh dorsal vertebra, where it met the descending portion. This portion took a course along the abdominal aorta, deviating toward the left iliac fossa. The liver and spleen were normal, but pressed somewhat from their positions. The kidneys and bladder were also normal. The bladder was encroached upon by the tumor, which was encephaloid in character and weighed fifty-four pounds.

The spinal cord was not examined, but as there was no paralysis, not even a paretic condition of the surface, I did not think it was of much account.

Although seen by some of the best physicians, he was a puzzle to all who examined him. None knew with what they had to deal. The microscope, except to examine the matter following the trocar and canula, I regret was not used. This cancer, which was discovered by the microscopical examination, however, led me to study all the diseases that had any bearing upon the case. I never class a case, unless it is typical, and therefore could find nothing similar to the one I have related.

It was not until Dr. Asdale informed me that he consid-

ered it a case of the osteitis deformans attended with cancer of the omentum, that I obtained Guy's Hospital Reports for 1877. Mr. Bryant's case had so many symptoms which were similar to the case I have described that I was partially satisfied that it was a case of the osteitis deformans. Since reading Paget's cases I find but two features at variance; namely, the patient's age and the rapid growth and termination of the disease.

But I have explained this fully in another part, and hope that in the future consideration of the disease we may discover that it begins earlier but is unnoticed before middle or later life, when the bones become ossified and are more susceptible to changes.

#### REMARKS ON OSTEITIS DEFORMANS.

This disease is so rare, and the opportunity to study it so meagre, it is impossible to give an elaborate description of it.

It was first noticed and named by Sir J. Paget, Bart., in an extensive paper which he read before the Medico-Chirurgical Society of London, on the 14th of November, 1876, and published in their transactions the following year (vol. 60, 1877).

CASE 1, upon which he dwells at length, he first saw in 1854. He assigned no cause for the trouble, unless we admit the damp and cold locality where the patient lived. A sister died of chronic cancer of the breast, outside of which no hereditary diathesis existed. The patient's parents and grandparents had lived to an advanced age, and up to the time of dissolution enjoyed good health. The tibiæ, femora, pelvis, and vertebræ were enlarged, as in the case I have related, with the addition of the cranial bones, which in my case I failed to take note of. He was subject to aching pains in the thighs and legs, felt mostly after active exercise, although they never were severely painful, and had no tenderness on pressure. His mind was undisturbed; he enjoyed good health, and suffered very little.

Iodine, which has a remarkable power over syphilitic and rheumatoid affections, made him worse. (In fact, in all recorded cases treatment was of no avail, if we except the escharotic treatment, and even that relieved only so long as the surface remained broken.)

In twenty-two years his head increased from  $22\frac{1}{4}$  inches in size to  $27\frac{1}{4}$  inches. With all this growth it was not, however, misshapen. The spine was curved, so that he decreased in height from six feet one inch to five feet nine inches. The chest was contracted and narrow, and the movements restrained. The natural posture was strange and peculiar, and the attitude simian.

In 1870, the left knee-joint was for a time actively inflamed and its cavity distended with fluid. This was the only ante-mortem evidence of an inflammation, and it soon subsided, leaving the joint stiffer and more bent. At the same time he showed signs of valvular insufficiency, as in Mr. Bryant's case, with considerable atheroma of the aortic valves and vessels (which, however, can be credited to age, both patients being in the neighborhood of sixty years of age).

In 1872, his sight was partially destroyed by retinal hemorrhage, and at the same time he lost the partial use of his hearing, assignable in all probability to a hemorrhage also.

It was not, however, until February, 1876, that any thing of a vicious nature was discovered, when a firm medullary or osteoid cancer was seen growing around the left radius, and from a subsequent cancerous involvement of the lungs he died on the 24th of March in the same year.

His other cases are not so complete, but they follow much the same course, and two of them died of cancer: one of cancer of the upper part of the humerus, subsequent to amputation at the shoulder; another of cancer of the brain.

There are in all recorded cases an increase in the quantity and a degeneracy of the bone-texture, and in three out of five cases carcinomatous disease complicates—the other two cases still living at the time of report.

Sir James Paget thinks it begins in middle age or later, and is very slow in progress. This is, perhaps, the rule, but the case I have described is an exception to it, he being

only eighteen years old when he first noticed his trouble (which was attributed to rheumatism), and only twenty-one years old when he died. I consider, however, this rapid termination was brought about by the cancerous invasion which was unnoticed four months before death.

In osteitis deformans there is a gradual enlargement of the bone, affecting all the bones of the body excepting the facial and phalangeal bones, attended with no fever or disturbance of health. Later in the history of the disease the special complication seems to be cancer. Heredity appears to play no part in the etiology of these cases.

Early in the disease pain of an obscure kind, simulating rheumatism, is present, aggravated while the patient is exercising. Mr. Bryant considers this pain to be caused by the yielding of the softened textures. My impression is that it is located in the region of muscular attachments, as it is not so severe even while standing as when the patient moves about. This symptom I think important, as it goes a good way toward proving the inflammatory nature of the disease.

The patients have usually a simian attitude. It was not, however, the case in the one I have described. Still I attribute this partly to the large tumor and partly to the bones not suffering the marked degeneration as in Sir James Paget's and Mr. Bryant's cases. His legs were bowed; and while sitting, semi-extended, as in the cases above.

Sir James Paget's reason for calling it inflammatory is remarkable; and while I do not fully agree with him, yet I am at a loss to give a better one. The softened texture, with nature's endeavor to restore the affected parts, together with the symptoms above quoted, can point to no other known cause. That there is a change in the nuclear formation is evident by the irregular increase in the quantity without a

corresponding increase in the texture of the bone. This is the result either of an obscure osteitis, or else the bones receive a stimulus the nature of which we do not understand.

The causes are obscure or unknown. In the case I have related I might infer a concussion of the bones sustaining the weight of the body. That a fall from a height will produce concussion, if not a fracture, is as plausible as that a blow upon the cranial vault will produce concussion of the brain, or a sudden downward fall, as upon the nates, will produce concussion of the spine. This cause must be ruled out, however, from the fact that all the bones of the body, with the exception of the phalangeal and facial bones, are involved in the general degeneration. This is also why the inflammatory nature of the disease is doubtful. It is the only reason. There is an intemperate habit in the case I have described, which I flattered myself might have played an important part in his trouble. He was between the ages of seventeen and eighteen years when he received what is supposed to be the cause of his complaint, before the epiphyseal ends had united with their shafts; and on account of his powerful frame, was subject to a greater labor than his age permitted. These two factors, in connection with the intemperate habit, would stimulate nature to rebellion. But Sir James Paget's and Mr. Bryant's cases set this aside by reason of their temperate habit and corresponding life.

In the study of osteitis deformans there are several diseases of the bone which are to be examined in connection with it. It can, however, be easily diagnosed, if we hold strictly to the fact that it is an increase in the bone with a softening of it; or, as Sir James Paget expresses it: "The structure appears to have been almost entirely removed and laid down afresh on a different plan and a larger mould." In endeavoring to class my case with them I soon discovered the vast difference.

Rachitis is an affection of early life, and invariably presents a history that dispels all doubt of its nature. There is instead of an apparent hypertrophy a general atrophy of the bones affected.

In osteomalacia there is a general softening in which the bones become brittle and break, and the epiphyseal ends become swollen. It mostly affects child-bearing women, and presents a cause which will aid in arriving at a correct diagnosis.

There is a group of hyperostoses I must mention in connection with this trouble, which are the result of an increased supply of blood or lymph from an active inflammation of an adjacent part. Sir James Paget claims they are not signs of the disease proper to themselves, and occur in the young alone. They present a healthy texture, that is, an increase in the quantity with a corresponding increase in the texture, and, with the exception of the tibiæ, the bones do not become deformed.

Osteoporosis, another affection of the bone, I was inclined to accept, but it being a disease of the bones where the compact tissue becomes porous, while in the osteitis deformans, although the Haversian canals and the lacunæ become larger, yet there is a corresponding increase in the bone (texture).

The above diseases have but one feature in common with the osteitis deformans; namely, the bending of the bones from weight of the body.

Doctor Daly reported a case in the *Medical Record* for February 28, 1880, which he calls elongating hypertrophy, or Paget's osteitis deformans.

To the observant mind it is easily recognized as a disease of a strumous nature. He has evidently not read Paget's paper, or has failed to recognize the prominent feature of the osteitis deformans, which I have quoted above.

The history of the child, its age, and the fact of the mother being unable to raise any of her children, point conclusively that it was suffering from a cachexia of early life.

A word more upon measurements: In examining the surgery in the Pennsylvania Hospital, we find that asymmetry is the rule and not the exception of the lower limbs.

That cancer should complicate where there exists no hereditary diathesis, is a fact worthy of notice. I can shed no light upon it, unless I may be permitted to suggest that it may be due to a germ latent for several generations from some ancestor unknown to the living; the same as syphilis is known to remain latent in one generation to show itself in the next.

The prognosis, while it is not the best, is nevertheless not bad. Unless carcinoma attends, the disease is not fatal, while at the same time it cannot be reached by treatment.

# METALLO-THERAPY, THEORETICALLY AND PRACTICALLY CONSIDERED.

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## PART I. — METALLO-THERAPY, THEORETICALLY CONSIDERED.

IN France the claims of metallo-therapy are sufficiently well recognized. The subject has been thoroughly discussed in the French journals, which for the past five or six years have teemed with articles concerning it, and reports of cases.

"Metallo-therapy is no more denied," says Charcot.<sup>1</sup> "It is a question solved; the facts have been methodically established, and they now remain an acquisition to science."

"The experiments," affirms Vigoureaux,<sup>2</sup> "have been daily repeated on an enormous number of patients of both sexes in ordinary practice, as well as hospital; and these observations have resulted in a body of doctrine as well defined as that found in any other department of physiology. The results obtained are directly due to the application of these agents, and are united by certain laws to the conditions of the organism."

In America, few have given any attention to the subject; and very little beyond the reports of a scanty number of cases has been written about it. To many of the profession who are not neurologists, the word metallo-therapy

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<sup>1</sup> *Gaz. des hôp.*, 1881, p. 1199.

<sup>2</sup> Quoted in *Journal of Mental Science*, Jan., 1879.

conveys little meaning. Its mention is often accompanied with a shrug of the shoulders and a sceptical smile, and there are those who regard it as a resurrection of ancient cabalistic and astrological practices addressed to the imagination of the patients. That this should be so is not strange, when the peculiar history and the peculiar results which baffle the theorist are taken into consideration; as well as the fact, that few have troubled themselves to put it to a test. The whole subject forms one of the most singular and striking chapters in the art of healing.

### *Definition.*

Metallo-therapy is used to designate the employment of metals, externally and internally, in the healing of diseases in which they have been found serviceable.

In a broad sense of the word it also includes weak electrical currents,<sup>1</sup> solenoids, statical electricity, and magnets, because in very many instances the results have been strikingly similar; and the theories brought forward to account for the effects of the one seem to account for those produced by the others.

In its broadest sense the latitude of its meaning has been extended to embrace all the natural agents and processes, to which Charcot has given the name *æsthésiogène*, which, like metals, have a specific action on the sensibility and various other functions.

### *History of Use of Metals.*

The use of metals in disease is no new thing. Aristotle, Galen, Alexandra de Tralles, Paracelsus, and other celebrated physicians of antiquity, ignorant of the scientific aspect of the question, attributed the efficacy of their remedies to the magic inscriptions which they bore.<sup>2</sup> In the

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<sup>1</sup> Insulated coil of wire connecting two poles of a single element.

<sup>2</sup> *Brain*, vol. i, 1878, p. 331.

eighteenth century metals attracted attention, together with animal magnetism, and one finds in connection with their use the names of Lenoble Mesmer, Barea, of Vienna; Osterwald, Director of the Academy of Science at Munich. In a report addressed to the Société Royale de Médecine de Paris, the commissioners, Mauduyt, Andry, and Thouret, gave testimony to the good effects obtained by the application of metallic plaques to painful points.

Wichmann,<sup>1</sup> in a work entitled "*Ideen zur Diagnostik*," published in 1778, relates the history of an hysteric in whom contractures and convulsions were calmed instantly on the external application of iron. He was sure the action was not due to temperature or pressure, since no other metal would produce the effect. Wicke, in 1844, gave pictures of the attempts to use metals made by different ones, especially by Sachs, who was the editor and commentator of Wichmann in 1827. These experiments fell into oblivion.<sup>2</sup>

In 1820 Despine, who was interested in hysterical and other nervous affections, while resorting to magnetism to determine the difference between organic and functional disease, was led to study the different effects of metals. He was not slow to recognize a certain relation between metals and electricity, and stated that the remarkable curative effects produced by metals applied to different parts of the body, in patients suffering from certain hysterical affections, were of an electrical nature.<sup>3</sup> He found a special susceptibility to gold in the sick, and a different influence upon them of copper, zinc, and gold. Different patients described the effects in the same words, and from his observations he was led to believe that they depended on some

<sup>1</sup> *Bull. gén. de thérap.*, 1879, t. xcvi. Sur la metallo-thérapie, par L. H. Petit.

<sup>2</sup> *Compte rend. d. soc. d. biol.*, 1877, and *Gaz. des hôp.*, mars 7, 1878. De la metallo-thérapie et metalloscopie, par Charcot.

<sup>3</sup> "Observations de méd. pratique faites aux bains d'Aix, en Savoie," par C. H. A. Despine, père. Edité chez Aime Burdet, Annecy, 1838, p. 124.

natural and positive laws, which have not yet been observed ; that they are not produced at hazard by the caprice or deception of the patient, but that these laws which govern them are as immutable as those which govern the universe. In his work he cites a number of interesting cases to substantiate his statements.<sup>1</sup>

To Dr. Burq<sup>2</sup> belongs the honor of placing metals among recognized therapeutical agents. He observed that persons in the somnambulistic state of animal magnetism had a pleasure in certain metals, as gold and silver, and an aversion to others, copper in particular. This fact had been also noticed by others : Fisher in 1805, Richet before that time, and Despine in 1820. He insists that this was all these men claimed, and that they never experimented in metallo-therapy out of the magnetic state.<sup>3</sup>

An hysterical patient who had been hypnotized was ordered, while still in that condition, to leave the room to return to her bed in the ward. She obeyed, walking with her eyes shut until she reached the closed door. Upon seizing the knob, which was of copper, she uttered a great cry.

No especial significance was attached to the matter until it was recalled thirty-five years after, in 1847, when another patient in a state of artificial somnambulism touched a brass knob in opening a door. She was seen to approach it cautiously, and after her fingers had come in contact with it, to rub her hand upon her skirt as if she had touched something warm. When asked why she did so, she replied that contact with copper made her ill, that this metal burned like fire, and that was why she rubbed her hand after touching it. Several *sous* placed in her hands made her rub them against her garments very quickly. "But," said the experimenter to her, "you wear a medallion about your neck that you do not take off." "That is different," she replied ; "it is silver, and I like the touch of silver and gold."

<sup>1</sup> *Lyon méd.*, juil. 18, 1880, xxxiv. La metallo-thérapie en 1820, par le Dr. J. Monard.

<sup>2</sup> "Des origines de la metallo-thérapie," par M. le Dr. Burq. *Gas. des hôp.*, 1882.

<sup>3</sup> *Lyon méd.*, dec., 1880. La metallo-thérapie depuis 1850. Répons a MM. Despine et J. Monard.

The patient was put into a profound sleep to prove that the effect was not due to imagination. It was found that contact of the metals produced the same result; as was the case when experiments were tried on different days.

The effects were more striking when the size of the object used was increased. When a candlestick or saucepan of copper was placed in bed at a distance of 20 to 50 cm. from the body, she became oppressed, repelled it, and became angry at the attempts made to keep her in its neighborhood. Afterward, when this patient was sick in bed, sensibility having been abolished by magnetism from an arm, a *sou* was placed upon the external portion of the middle of the forearm, which, after three or four seconds, she would always throw off. Pricking with a pin showed the return of sensibility under the *sou* and in its neighborhood. The arm was reanæsthetized, and silver and gold were tried without effect.

Another experiment was to make the arm cataleptic and rigid, and then to apply copper. After several seconds the muscles became supple, the anæsthesia disappeared, and the member recovered its liberty. The same application of silver and gold availed nothing. Steel gave the same effect as copper, but not as rapid.

After the death of this patient, Dr. Burq made the same experiments on others and obtained the same metallic phenomena, the same attractions and repulsions, and the same subjective phenomena. Copper alone, or alloyed to form brass or bronze, was always pushed away and invariably caused a return of sensibility or a relaxation of a contracted muscle. Steel and iron were tolerated by certain subjects, while an alloy of gold produced repulsive effects. It was also found that applications of copper were efficacious in certain isolated spasms and in trismus supervening on the magnetic crisis. Muscular weakness disappeared equally with anæsthesia.

The case of Pauline, at the Hospital Cochin, is famous in the history of metallo-therapy.

She was affected with absolute amenorrhœa, a general paralysis.

which confined her to her couch almost constantly, a complete paralysis of the bladder necessitating catheterization five or six times a day. Other treatment having failed, in despair animal magnetism was attempted. On the first day of this treatment, the patient, upon awakening, was attacked with various thoracic spasms. One evening these were of peculiar violence. To cut them short, a large plaque of brass was applied to the epigastrium. Less than two minutes after, suffocation, palpitation, and vomiting ceased, and she slept calmly during the night. In two or three days the same symptoms re-occurred, and the same effects were obtained with brass. After several moments of great calm, the plaque was removed, and very soon the thoracic spasms were renewed with all their first intensity. When the disk was returned, the calm which ensued witnessed authoritatively to the anti-spasmodic effect of the copper.

Every fourth day, at night, Pauline had a severe attack, which was accompanied by complete loss of consciousness, and which lasted several hours.

On one of these occasions it required five persons to hold her upon her bed. The expenditure of nerve force was prodigious. It seemed as if the muscles of the frail creature, almost paralyzed in their ordinary state, could not contract with such energy without rupturing them. The spasms subsided upon the application of copper plaques. The violence ceased, and the patient recovered consciousness.

Dr. Burq recommended the use of copper plaques applied over the abdomen, to relieve the cramps and spasms of cholera; led to believe they would be efficacious from the facts that workers in copper experienced an immunity from the disease, and that this metal was useful in cases of hysterical spasm. It proved very successful as employed in the cholera wards of various hospitals in the epidemic of 1849.<sup>1</sup>

Now thoroughly convinced that he had made a valuable discovery in therapeutics, Dr. Burq went to the Hospital of Salpêtrière to further prove and test it. He first tried it in the epileptic wards without success. The attacks continued as if no metals were used. He next experimented with five patients who were confirmed cases of hysteria.

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<sup>1</sup> *Gas. des hôp.*, nov., 1849. Leçons cliniques de Rostan sur le choléra.

Belts and bracelets of copper placed upon them gave almost immediate effects. Anæsthesia disappeared. Upon the fourth the results were almost negative. On the fifth there was no change. Whenever a crisis appeared, the first three resorted to the metals, and during the first month the attacks became less frequent. At the end of two months Dr. Burq was obliged to leave the hospital on account of business. Upon returning after an absence of six weeks, he found that they had had no more attacks. They were cured by four applications after he left.

Sylvain, the fifth, alone remained unaided. All attempts to affect her with copper were unavailing. She laughed at pin-pricks, no matter how deep. One day (March 2, 1850) she was found sewing with an iron thimble. The idea occurred to Dr. Burq to test the sensibility of that finger. She uttered a loud cry upon being pricked. The other fingers were insensible. Placing the thimble in turn on the other fingers and thumbs, in ten minutes the sensibility returned. Substituting a copper thimble for iron, the anæsthesia remained.

This experiment established the fact of polymetalism in the place of monometalism.

For twelve years Dr. Burq went about among the different hospitals, experimenting at L' Hôpital Cochin, Val de Grâce, La Salpêtrière, L' Hotel Dieu, Maison Dubois, Necker, and others; but the new therapy was received with silence and disdain. Of this period, he says pathetically: "Despairing of success, I ceased my peregrinations to the hospitals, gave my pen repose, and sought diversion in other work."

*Reports of the Commission of the Sociétt de Biologie.*

In August, 1876, Dr. Burq applied to the Société de Biologie to appoint a commission to study the results which

were obtained by the application of metals to the cutaneous surface. MM. Charcot, Luys, and Du Montpallier<sup>1</sup> were appointed, and after the most careful and elaborate experimentation, they presented their report. It was read April 14, 1877. It established the following facts :

I. That the application of certain metals to the skin of hysterical and anæsthetic patients, and in several cases of organic lesions, determines important modifications of which the principal is the return of general and special sensibility.

II. All patients are not susceptible to the same metal, gold, iron, and copper giving results positive or negative according to the patients submitted to the experiments.

III. The phenomena observed after the application of the metals are produced in the order established by Dr. Burq, viz: The patients feel at first at the point of application of the metals and in a zone more or less extended, pricking, a sensation of heat ; then shortly in the same region there appear a redness, a return of sensibility, increase of temperature measured by the thermometer, and at last a return of muscular force measured by the dynamometer.

In the course of these experiments it was further discovered that very weak electrical currents produced a return of sensibility ; and also that there was a transfer of sensibility from one side of the body to the other, under the influence of the applications of metals or continued electrical currents.

A second report was given by the same committee,<sup>2</sup> August 10, 1878, which established the second proposition of Dr. Burq: that the aptitude of the patient having been determined by external application of metals, the internal

<sup>1</sup>Étude expérimental sur la metalloscopie et metallo-thérapie du Dr. Burq. Premier rapport.

<sup>2</sup>Étude expérimental, etc. Second rapport.

administration of the same metal would determine the same results.

To thoroughly appreciate the labors of this committee, a perusal of the whole report is necessary.

The prize of Ernest Godard was bestowed upon Dr. Burq, and he received a greater and more coveted boon, the recognition and respect of the scientific world, for his discoveries in metallo-therapy, for which he had waited nearly thirty years.

*Phenomena of Transfer, Oscillation, and Fixation.*

The phenomena of transfer, which was discovered during the experiments of the commission, is one of the most surprising facts connected with metallo-therapy. M. Gellè, in testing the hearing in the hysterical patients, found that while the hearing of the affected ear, after the use of metals, was improved, that of the ear of the opposite side was decreased by just so much as the other had gained. Landolt discovered, in cases of achromatism, when the power of distinguishing certain colors had returned in the affected eye, it disappeared correspondingly in the other. In the same way there was a transfer of sensibility, temperature, and muscular power.

After the transfer, there is a return of anæsthesia to its accustomed seat, and of sensibility to the normal side. This was called by Dr. Burq "the anæsthesia of return," and when it appeared the experiment was at an end. But Charcot has found that there is a succession of spontaneous transfers following the first one, each lasting very nearly the same time as the first. The number depends on the person and the æsthésiogène used. The transfer is not complete, one side gaining what the other loses; the result is an accumulation of these differences. To these successive transfers Charcot has given the name oscillations.<sup>1</sup>

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<sup>1</sup> *Arch. de neurologie*, vol. i, 1880.

Transfer is not always present, and generally takes place in the patients affected with hysteria, and not in those under treatment for organic disease.

Simple excitation of the surface of the body, as with a sinapism, causes an increase of sensibility at the point of application, and a diminution of that at the symmetrical point of the other part of the body.

Adamkiewicz<sup>1</sup> and Adler<sup>2</sup> advance the theory to account for the phenomena of transfer, that certain of the bilateral functions of the body, performed by symmetrical organs, are presided over by symmetrical ganglionic centres, which are antagonistic, the one to the other, in the exercise of their functions.

In testing to ascertain the susceptibility to metals, it had been the practice to place the different kinds at different places on the anæsthetic part at the same time. The metals under which the sensibility had returned were the ones to be used in the case ; the others, under which the sensibility had not been aroused, were considered ineffectual. The former metals were called " active " for that case, the latter " inactive " or " neutral." While experimenting in this way it was found that if an inactive metal were superimposed on an active metal, or placed anywhere between it and the central nervous system, the phenomenon of transfer and the return of sensibility would not take place, if the two metals were put on at the same time ; or if the active metal had caused a partial return of sensibility, and the inactive metal was then used, the area of returning sensibility would remain the same, and not increase as it would have done had not the inactive metal been used.<sup>3</sup> In this

<sup>1</sup> *Arch. f. Anat. und Physiol.*, 1880, p. 159. Ueber bilaterale Functionen.

<sup>2</sup> Ein Beitrage zur Lehre von dem bilateralen Functionen im Anschluss an Erfahrung der Metalloskopie. Inaug. Diss., Berl., 1879. *Brit. Med. Jour.*, May 10, 1879.

<sup>3</sup> *Bul. gén. d. thérap., loc. cit.* *Brit. Med. Journ.*, 1879, Nov., p. 767. Dumontpallier. *Arch. d. neurol.*, vol. i, 1880 : metalloscopie, metallothérapie, æsthésiogène, par Vigoureux.

manner, not only the effects of metals, but those of magnets and electricity, can be prolonged at will. The neutral or inactive metals will be found to be those which rarely produce results.<sup>1</sup> The theory advanced to account for this curious fact of arrest or fixation will be discussed farther on.

### *Discussion of Theories.*

#### I. EXPECTANT ATTENTION.

That the effects observed in metallo-therapy are due to expectant attention is a theory which has, naturally, been most often expressed. When Bennett found that non-metallic bodies would produce the same results in some instances as metals, and when Westphal and others found that sinapisms caused a return of sensibility and the phenomena of transfer, it was thought by many that proof positive had been obtained, that metallo-therapy simply appealed to the imagination.

Bennett, after experimenting on several cases, came to the following conclusions :

1. The phenomena (for he had obtained them) occur in hysterical patients prone to sudden changes.
2. None of the effects are inconsistent with what is well recognized as the influence the mind possesses over the body.
3. Anæsthesia and analgesia are changing and varying symptoms.
4. Metals have been used for a long time in an uncertain and inconstant manner.
5. No metals equally suitable.
6. Disks of wood do as well as metals.

These results led him to conclude that metallo-therapy was of mental rather than physical origin.<sup>2</sup>

<sup>1</sup> *Prog. méd.*, 1878, juil. 27, p. 573.

<sup>2</sup> *Brain*, vol. 1, 1878, p. 331. *British Med. Journ.*, 1878.

Aigre<sup>1</sup> was also of this opinion, as was Beard, who, having tried it in a number of cases, announced his conviction that organic affections can often be relieved by a mental influence better than by medicine; and that functional diseases of different kinds can be healed in this manner.

It has also been suggested that the results may be due to the personal influence of an individual rather than to the effect of the metals upon the system.

To most who have thoroughly studied the subject it would be exceedingly difficult to credit personal influence, or attention, suggestion, and imagination, with the unexpected results obtained.

In the first place, the application of metallic disks appeals less to the imagination than almost any form of external treatment. Less imposing than the buzz of the faradic battery, less impressive than a collection of galvanic cells, it has had effects where these have been persistently tried.

The patients often say: "You do not expect these (referring to the disks) to do any good?"

In the second place, healing occurs when the patient and the one applying it least expect it. Experimenters have applied a metal, thinking that they had a certain one when they had not, and discovered their mistake only when they found that the usual effects were wanting.

Thirdly, patients in Germany, France, England, and America, and in widely different circumstances, have expressed the effects of the metals in the same words, and the same results have been obtained.

Fourthly, how could a theory of imagination or expectant attention account for the phenomena of transfer, especially when occurring in cases of achromatopsy, or in the hearing? How could it account for the fixation or arrest by a neutral or inactive metal?

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<sup>1</sup> *Thèse de Paris*, 1879.

Fifthly, the application of metals on healthy individuals, while negative so far as yielding any results from which to deduce conclusions, proves that there are effects, since in some there is an augmentation of the sensibility, in others there is a diminution, while in still others there are no results.<sup>1</sup>

Sixthly, experiments on animals are more conclusive.<sup>2</sup> Vierordt tested the susceptibility of frogs to metals. He removed both cerebral hemispheres, and after fifteen minutes he applied the metal to the abdomen and occasioned a return of sensibility, which had been lost. He used zinc and lead. He calls attention to the fact that the experiments were performed in November and December, when the excitability of the frog is much less than at any other time of the year. Schiff experimented with negative results in the frog; but in dogs, where a lesion had been made in that part of the hemisphere which corresponds to the anterior paw, so that there was no excitability to touch or tickling, a solenoid in fifteen or twenty minutes caused a very marked excitability which lasted five hours. When centres for both fore and hind paws were affected, sensibility returned in both members when the magnet was applied to the forepaw, which remained three or four hours.

He states that the experiments correspond to those on man. In one of his cases of hysteria he used artificial magnets from which he could turn off the currents at pleasure. Periods of the return of sensibility were the same as when the current was on.

To the statement that, since non-metallic bodies produce the same effects, the results must be due to expectant attention, Vigoureaux responds that "it is claimed that a certain number of physical agents produce invariably the same

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<sup>1</sup> *Bul. gén. d. therap., loc. cit.*

<sup>2</sup> "Metalloscopy of Frogs." *Brit. Med. Jour.*, 1879, p. 159, and *Centralbl. f. d. med. Wisschft.*, No. 1, 1879.

series of phenomena in question, while other agents, or the same in other conditions of intensity, never produce them. Whether disks of wood, or the same disks under different conditions, do not produce the same results, is a matter of secondary consideration."<sup>1</sup>

## 2. ELECTRICAL THEORIES.

The commission appointed by the Société de Biologie had found by the aid of delicate galvanometers that exceedingly weak currents were generated in the zone of the application of metals. The needle indicated  $2^{\circ}$  to  $10^{\circ}$  for gold;  $8^{\circ}$  to  $15^{\circ}$  for copper. They also found that the direct action of a current of  $2^{\circ}$  to  $10^{\circ}$ , in patients who had a susceptibility for gold, gave the same result; and a current of  $34^{\circ}$ , in those sensitive to copper, produced like effects. If the metallic idiosyncrasy was known, a current of the same intensity as the metal could be substituted, and analogous results, return of sensibility, elevation of temperature, and a return of muscular force, could be obtained.

Marigliano and Seppilli repeated the experiments performed by MM. Charcot, Gellé, and Landolt, in relation to the influence of electrical currents the magnets on anæsthesia, and arrived at the following conclusions:

1. In hemianæsthesia, the application of electrical currents, or metallic plaques, or of magnets determines not only a return of general sensibility, but also that of special sensibility.

2. In hemianæsthesia of cerebral and organic origin, the return of sensibility caused by these different means extends not only to the zone of application, but also to all the anæsthetic portion of the body.

3. In hysteria, the return of sensibility of the anæsthetic side coincides with the disappearance of the sensibility of the sound side, and that in a zone perfectly symmetrical.

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<sup>1</sup> Quoted by Petit. *Bull. gén. de thérap., loc. cit.*

4. The duration of the return of sensibility is more persistent in the cases of organic than in those of functional anæsthesia.

5. It is probable that the different means which determine these effects all act by means of electrical currents, which in their turn act on either the vaso-motor fibres or more especially on the sensitive fibres.<sup>1</sup>

Onimus thought that possibly metals acted on the electro-capillary currents of the system, but afterward agreed with M. Rabateau that the development of electricity was due to a certain degree of oxidation of the metals, which takes place when they are applied to the moist skin; that the metals were not chemically pure; that every metallic plaque, not chemically pure and undergoing oxidation, was an electrical element; and that it was an electrical action to which one must attribute the effects obtained.<sup>2</sup>

Eulenburg, as well as Regnard, found that a current is engendered by the contact of the skin with metallic plaques, which vary in force and direction according to the metal employed. He repeated Regnard's experiments with great care, using non-polarizable electrodes. He found that the metallic plaques, placed on different parts of the skin of certain individuals, gave varying results; and that different metals varied greatly. Zinc, which with some persons is stronger than gold, is much weaker in others. Moreover, he found the currents generated, different on different days. He attributes the variation to the chemical nature of the cutaneous secretion, which is subject to exaggerations in nervous affections. To prove this, he placed dry paper between the skin and the metal, which caused an arrest of the current. If the paper were saturated with salt, the current was of greater intensity.

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<sup>1</sup> *Rivista sperimentale di Freniatria*, anno iv, fascicolo 1, 1878, p. 36.

<sup>2</sup> *Rapport d. com. de soc. d. biol.*

Gold and platinum, chemically pure, were found almost without action, both by himself and Regnard, and they both state that they pass equally for having little therapeutical action.<sup>1</sup>

Bocci<sup>2</sup> also upholds the chemico-electrical theory.

If only the effects of metals, weak electrical currents, and magnets were to be accounted for, the electrical theory would satisfy those who accept metallo-therapy as resting on any scientific basis; but it has already been stated that Bennett and others<sup>3</sup> with disks of wood, and Westphal with sinapisms and disks of bone, obtained a like result. Schiff found that wet compresses of thick woollen cloth, as well as sinapisms, caused a return of sensibility.<sup>4</sup> Thermes could produce it by means of hot and cold douches. Other ex-

<sup>1</sup> *Deutsche med. Woch.*, June 29, 1878.

<sup>2</sup> Bocci used the ciliated epithelia of the œsophagus of the frog to demonstrate the action of metals. He employed the graphic method, and obtained tracings indicating the rate of movement of a foreign body urged on by the cilia, which, as is known, are capable of propelling an incredible weight down the œsophagus to the stomach. As the cilia continue to move a long time after the death of the frog, he removed the œsophagus from the palate to the stomach, laying it open so as to expose the superficial surface of the lining membrane, and placed it on an instrument so that any movement could be recorded by a lever writing on a revolving cylinder. He used thin and polished strips of metal, upon the size, not weight, of which he lays great stress. They must be 15 mm. long by  $3\frac{1}{2}$  mm. wide; 1, or less than 1, mm. thick. He introduced two thirds of such a strip carefully under the stomach-end of the œsophagus.

He found that certain metals, which he named "excitor"—gold, copper, silver, and platinum,—increased the power of the cilia; others, the "inhibitory"—zinc, cadmium, and bismuth,—lessened it; while another group, the "indifferent" metals—tin, iron, and lead,—had no effect.

The action of the metals, continued from two seconds to one or two minutes after their removal. This he called their residual action. He also found that after the metal was applied the cilia had unusual motions: the vibratile wave, which is always in the direction of the stomach, would be reversed, or the cilia would not be in accord. The microscope, as well as the tracings, showed this very plainly.

He advances the frail hypothesis—frail since it is based on the still uncertain histological anatomy of the ciliated cell,—that the action of the metals is on the contractile substance which forms a swelling at the base of the cilia, upon whose physico-chemical processes he supposes the movements of the delicate filaments may depend.—*Riv. clin. di Bologna*, 1882, No. 9: *Nuove Ricerche sull' Epitelio e Contributo alla Metallo-magneto-xilo-scopia*.

<sup>3</sup> Dr. Desquin experimented with woods, and found that certain had æsthesiogenic properties, while others had not. Peruvian bark, rosewood, and pitch-pine aroused the sensibility. Poplar, sycamore, and ebony had no action. *Rev. mensuelle d. méd. et d. chirurg.*, juin 10, 1880, p. 402.

<sup>4</sup> *France méd.*, 1879, xxvi.

perimenters have brought about like effects with ivory and glass.

If, then, disks of wood, ivory, bone, glass, wet compresses, hot and cold douches, could provoke the phenomena of metals as well as weak currents and magnets, it was evident to the investigators of the subject that an electrical theory of wider application than that held by Rabateau and Onimus, Regnard and Eulenburg, must be resorted to; therefore to meet this demand the thermo-electric theory was advanced.

Non-metallic as well as metallic bodies in contact with the skin determine changes of temperature. DuBois Raymond has demonstrated that thermo-electric currents can be produced by the inequalities of temperature that one would not believe generally capable of possessing this influence; and that other causes difficult to discover can give birth to currents and to an electro-motor action. Each body affecting differently the cutaneous surface should give birth to currents of varying intensity.

Vigoureaux,<sup>1</sup> in reply to the electro-chemical theory, declares that the chemical action of the metal upon the skin is not an essential condition. It is not necessary to have a current to obtain the modifications under discussion. He has proved this by the use of a pile well isolated, and the application of a single pole, which produced the same effect as the current itself. When both poles are used, the same unipolar action takes place at two different points. He believes that the phenomena of metallo-therapy are brought by a greater or less variation, during a variable time according to the subject, of the electric tension on a limited portion of the body. Physicists admit that simple contact is a source of electricity; and that two metals charge themselves

<sup>1</sup> *Gaz. méd. de Paris*, Dec. 14, 1878, p. 620. Sur la théorie physique de la metalloscopie. *Arch. d. neurol.*, 1881-2, ii, p. 92.

with different kinds of electricity independent of all chemical action, as do also a metal and a liquid. The electro-motor force so developed varies according to the nature of the bodies in juxtaposition.

He concludes that an electrical state determined to the peripheral organs of general and special sensibility, is necessary to the exercise of these functions; and that one can modify this electrical state, and consequently the sensibility, in determining to the surface of the body a phenomenon of tension. That which can do this is the application of metals, of polarized plaques, electricity by a single pole, and the electrical current.

The electro-chemical theory could not account for the fact that the effects produced by an active metal can be fixed or arrested by a neutral metal placed upon it or above it.

For example<sup>1</sup>, a piece of silver placed on a piece of gold has been seen to arrest its action. As the skin and silver did not come in contact, the result could not be on account of the action of the cutaneous secretion upon the silver. The effect of the superimposed plaques comes under the law of tension, which the tissues obey, as do several solutions of chlorides and sulphates. According to this law, the total tension which results from a series of contacts is the same which will be given by the direct contact of the two extremes of the series. The skin and the metals are in effect two metals.

Combine this theory of Vigoureaux's with the thermo-electric theory, to account for the effects of non-metallic substances, and the ground of causation of the phenomena of metallo-therapy is covered.

### 3. THEORY OF MECHANICAL IRRITATION.

Adamkiewicz and Adler<sup>2</sup> attribute the effects to the

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<sup>1</sup> *Compte rend. d. soc. d. biol.*, 1877, p. 462.

<sup>2</sup> *Loc. cit.*

mechanical power of irritation, and not to the electrical currents. They both think their position is proved from experiments with mustard poultices, which they give in detail, after the use of which there was a greater return of sensibility than with the metals, with also the phenomena of transfer.

#### 4. SCHIFF'S MOLECULAR THEORY.

Schiff<sup>1</sup> felt compelled to discard the electrical theory as insufficient to account for and explain all the facts which a careful investigation of the subject revealed. In the contact of a metal and the skin, the enormous resistance of the latter and the exquisite conductivity of the former render these currents so feeble and transitory that one could not attribute to them the production of the physiological phenomena in question. He fell back upon a broad and comprehensive basis of a modification of the molecular motion, a theory which he presents in a pleasing and attractive manner. Very probably, says Schiff, the molecular movements vary according to the density, specific heat, electrical state, and other properties, and that from this arises the difference of physiological action. One can suppose that the molecular vibrations of a solid only act on the sensibility of an animal when their rhythm has a certain affinity with the molecular movements of the nerves in action; the same as a cord vibrating only causes another to vibrate when the vibrations reach a certain determined figure. One can admit that in hemi-anæsthesia there is a molecular modification of the nervous system that does, and probably always will, escape anatomical investigation. Let one imagine, he continues, that in hysteria the nerve-molecules are more mobile than in the normal state, and that in a point of the nervous axis between the spinal cord and a

<sup>1</sup> *Arch. d. sciences physiques et naturelles*, Genève, 1880; and *Bul. gén. d. thérap.*, 1880. De la metallo-thérap., par Dr. Noel de Mussey.

part of the nerve-fibres there arises, from an unknown cause, an anomalous molecular condition, which hinders the transmission of the movements which produce sensation. If then there is directed on the injured part vibrations of a determined form, the nerve-molecules coördinate themselves harmoniously with the connecting nerves, and take a regular disposition, but in a state of unstable equilibrium. They offer then an irregular dynamic state.

In regard to the internal use of metals, Garel, who has made an extensive study of the subject, comes to the conclusion, that as the digestive mucous membrane is a kind of internal skin possessing nerve-terminations susceptible of modification, any theory which would account for the external action of metals would account for the internal; both act in the same way. He thinks the results of metals due to contact, and probably of an electrical nature.<sup>1</sup>

### *Conclusions.*

In view of the arguments already enumerated, as well as the facts of metallo-therapy, which will be discussed at greater length, and illustrated with reports of cases, when the practical side of the question is considered, the theory of expectant attention must be set aside as wholly inadequate to explain the surprising phenomena witnessed.

The electrical theories are far from satisfactory. The chemical action of the secretions of the skin upon the metal would be plausible, if only metals produced the results.

Vigoureaux's theory of electrical tension goes farther, and accounts for arrest or fixation of effects.

The thermo-electric theory relieves the perplexity incident upon the discovery that non-metallic substances produce the same results as metals.

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<sup>1</sup> *Lyon méd.*, juil. 4, 1880, t. xxxiv.

Schiff's theory of molecular motion and change of rhythm satisfies the imagination, and sounds logical, since it is in unison with the generally accepted beliefs held in regard to generation of nerve-force. It leaves no possibility for disputation, since he passes beyond the realm of what can be seen and measured by the senses.

Then, after all, the explanations advanced are little better than hypotheses. The difficulty of constructing a tenable theory is sufficiently recognized by all investigators of the subject. A knowledge of nerve force less shadowy and ill-defined than that of the present must be obtained to furnish the corner-stone that is lacking.

## EDITORIAL DEPARTMENT.

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### THE GERM THEORY OF DISEASE.

THE great and ever-growing interest in the question of the relations of vegetable germs to disease has, during the past few years, multiplied the literature of this subject to such an extent that it is difficult, nay, almost impossible, for the general reader to keep himself as well posted as he might desire on this most important subject. For of its importance, who will doubt? It is a question of interest not merely to the physician, but one of the greatest weight to society at large; and it is certainly worthy to rank, along with Cohnheim's discovery of the process of inflammation,—that riddle which had baffled the attempts at solution for thousands of years,—as one of the first medical, or, to put it on a broader basis, biological discoveries of the nineteenth century. We gladly welcome, therefore, two works<sup>1</sup> which, within a moderate compass, give a good synopsis of the present state of our knowledge on this subject.

Though some of the older investigators, as Leeuwenhoeck and Spallanzani, investigated the nature of putrefactive processes, and made discoveries that were forerunners to our present knowledge, yet the real science of mycology, in its relation to disease, dates from the middle of the present century. In 1848 Fuchs discovered micro-organisms in the blood of septicæmic

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<sup>1</sup> See under Book Reviews: "Bacteria and the Germ Theory of Disease," by H. Gradle, M.D.; and "On the Relations of Micro-Organisms to Disease," by Wm. T. Belfield, M.D.

animals; and Brauell and Davaine in 1849 and 1850 observed the anthrax bacillus in the blood of sheep dead of that disease. Still, it was not till 1861, when Pasteur published his work on fermentation, that the relations existing between what are now called bacteria and disease were pointed out. Since then the science of mycology has been making rapid strides. Numerous pathologists in all countries have prosecuted the study, and though, as is perhaps natural, a great quantity of ill-judged work has been hurried into print, and many wrong observations chronicled as facts which, when disproved, have had some tendency to throw the whole subject into contempt with the general medical public, yet, on the whole, the work has gone steadily forward, and this progress we owe principally to two men,—Pasteur and Koch. Pasteur was one of the very first in the field, and labored under the disadvantage of having to invent himself all the methods he used, having but a very small and imperfect stock of the experience gained by others to go by. In spite of these obstacles he has done great and original work, and if all his statements are not marked by the accuracy that distinguishes his German collaborator, and if he is at times given to somewhat bold flights of fancy, due allowance should be made for the national peculiarities of a Frenchman. Koch improved and extended the methods which he found in use, and brought to bear on his investigations a mind too critical, and a judgment too cold, to become warped into partiality by any glittering semblances of truth. His thorough scientific honesty, his truly Darwin-like patience in waiting to thoroughly test by proof and counter-proof the accuracy of his observations, before announcing them to the world in print, his ripe judgment and clear reason, have all borne their fruits, and Koch stands to-day the foremost investigator in this field of science. To him we owe our knowledge of the life-history of the anthrax bacillus,—the work that first brought him into prominence,—and more recently that of the tubercle bacillus.

Bacteria are vegetable cells of various shape, devoid of chlorophyll, and consist of a highly refractive nitrogenous substance,

called by Nencki *mycoprotein*. As they exhibit a high degree of resistance toward the action of acids and alkalis, Cohn has supposed them provided with a covering of some hydrocarbonaceous material like cellulose.

In shape, they may be spherical (micrococci), or rod-shaped (bacilli), or spiral (spirillæ). Many of the rod-shaped varieties have a thread-like appendage at one end, called a flagellum, by means of which they are capable of motion through the liquids in which they reside. The motion so often seen in bacteria when examined in a drop of liquid, as urine, under the microscope, is not necessarily a sign of life, as this motion may be due to the Brownian movement seen whenever small particles are suspended in a liquid. They multiply in two ways, either by a bacterium dividing into two by fission (hence the name *Schizomycetes*, or *Spaltpilze* of the Germans), or by spores forming within them, which are set free by the death and subsequent disintegration of the bacterium.

Bacteria of one kind or another are distributed, as far as we know, everywhere; but some producing very marked and specific changes in the organisms in which they may happen to lodge, as anthrax, malaria, typhoid, yellow-fever germs, etc., etc., are endemic in certain localities, and are plants peculiar to those localities. To cite the best known of these, we will take the *bacillus anthracis*, which causes in animals the disease known as splenic fever; in German, *Milzbrand*; in French, *charbon*. This bacillus occurs in certain marshy districts of Europe, and to a limited extent also in this country, and causes the endemic appearance in the cattle inhabiting these parts of the splenic-fever disease. Koch has discovered that the plant grows as well outside of the body, in a suitable medium, as in it, and this explains the yearly recurrence of the disease at certain seasons of the year in the same localities without fresh infection being introduced from without. He found that the bacillus grows best in an *alkaline* vegetable infusion. Ordinarily, vegetable infusions are acid in reaction, but in these infected localities it has been found

that owing to lime in the soil they are alkaline, and hence afford the desired reaction for the best propagation of the plant.

Cattle, by grazing in these districts, become infected with the spores through abrasions on the lips, tongue, etc. ; or, as Koch has also shown, the spores develop in the alkaline fluids of the intestinal canal into the perfect bacilli, which then penetrate the walls, and thus gain entrance to the circulation. Another mode of infection is by direct contagion, one animal coming in contact with the secretions from the mouth or nose, or with the blood, of another already infected. In the living body the bacilli do not go on to sporification, but multiply only by fission ; but the bacilli which have been developed in the body from spores, by being eliminated by the secretions, and falling on the earth or grass of the fields in which the cattle graze, form new centres of infection, for here they go on again to the formation of spores. It is doubtful whether direct infection by means of the bacilli is often effected, since these are so easily destroyed. This is in marked contrast to the spores, which may be exposed to great variations of heat and cold, to the action of strong alcohol and other chemicals, without losing their vitality. The bacilli do not develop except at a temperature above  $18^{\circ}$  C., and in the presence of oxygen.

Pasteur attributed to earthworms the carrying to the surface of the spores developed from the bacilli buried with dead animals, but Koch has shown that at the depth at which animals are ordinarily buried, the temperature in European countries does not usually rise above  $18^{\circ}$  C., and that the bacilli soon perish. The dropping of the animal secretions containing bacilli is quite enough to account for all sources of repeated infection.

Probably the most widely diffused of all bacteria are those causing putrefaction and fermentation, for they seem to be ubiquitous. They are the great scavengers and chemists of nature, removing useless, dead material, and reconverting it into its original elements, to be used afresh for the making of new bodies, whether animal or vegetable. Different bacteria, morphologically

identical as far as we can determine with the means now at our command, may have very different chemical properties. Thus the *bacillus subtilis* found growing on hay, and the *bacillus anthracis*, are to all appearance exactly alike, yet the one is harmless, while the other is most deadly. Indeed, this very similarity, combined with errors in the experimental methods employed, induced Buchner to believe that the harmless hay bacillus could, by appropriate cultivation, be converted into the fatal anthrax bacillus, and that the two were in reality identical.

Koch, however, exposed the fallacy of this opinion by showing that Buchner's cultures were not pure ones, and that his cultivated hay bacilli had from the very first become contaminated with those of anthrax, which finally had so gained the upper hand as to crowd out the former, and consequently to produce, when inoculated, symptoms due to the latter alone.

Precisely in what way the bacteria induce in the body the changes which they do, is not known, but that they grow at the expense of the food which they consume is evident. Some have been found incapable of living without oxygen, whilst others die in the presence of it, or at least lose their characteristic properties. To the former Pasteur has given the name of *Aërobes*, while to the latter that of *Anaërobes*. That the bacteria by their growth soon exhaust the medium in which they are of its power of nourishing them, is shown by the fact that when in such a medium all further growth has come to a stand-still, by transferring a portion of its bacteria to a fresh culture-ground, their growth will go on uninterruptedly until this medium in its turn becomes exhausted.

In some cases it has been most clearly shown that the disturbances produced in a living body by the presence of organisms in it, are due not directly to their mere mechanical presence, but to the effects of some substance elaborated by them in their growth, and which acts as a poison upon it. Thus Panum induced symptoms of great depression, vomiting, purging, collapse, and finally death, with or without fever in different cases, in dogs in which he

had injected varying quantities of a carefully filtered solution of rotting nitrogenous substances. Possibly these effects were due to the ptomaines, those cadaveric alkaloids which, as Selmi has discovered, are produced in decomposing organic remains. Bergmann and Schmiedeberg found in putrid yeast a crystallizable substance which they called *Sepsin*. This when injected produced in dogs immediate fever and the intestinal symptoms of putrid poisoning.

In pyæmia we have a disease characterized by a septic fever, accompanied by the formation in various organs of metastatic abscesses. These abscesses are caused by the deposition in the different organs of emboli containing micrococci, which when once lodged cause a local suppuration by their growth. The micrococcus of pyæmia Koch has found to grow in colonies in the blood-vessels, and to cause thrombi in them, by surrounding the blood corpuscles, and thus rendering them more adhesive. Parts of these thrombi are torn off and are carried into the circulation as emboli, taking with them the micrococci, and causing, as we have seen, those metastatic abscesses characteristic of the disease. If the blood of a pyæmic animal, after having been carefully filtered through clay, or having its bacteria killed by boiling, be injected into another animal, a septicæmia alone will be produced, without the formation of metastatic abscesses; and, furthermore, the blood of the second animal is not infectious, showing that while pyæmia with metastatic abscesses is due to the growth of a living specific bacterium in the organs, septicæmia is caused by the poison elaborated by the bacteria being introduced into the system. This may occur from the absorption of the secretions of a wound alone, the bacteria themselves not gaining an entrance to the body. It may be due also to the presence of various kinds of bacteria, some micrococci, some bacilli, as Koch, Gaffky, Pasteur, and Sternberg have shown.

It would almost seem as though the febrile symptoms of septicæmia were due to the disintegration of the white blood globules by the septic poison, and the setting free thereby of fibrino-plastin

and fibrin-ferment, for the blood of septicæmic animals contains more free fibrin-ferment than normal, and Bergman and von Angerer, as well as others, have found that the injection into the circulation of small quantities of pepsin, trypsin, and other ferments which effect a liberation of fibrin-ferment, cause a fever exactly like that of septicæmia—observations which we have had the opportunity of confirming. Still, we are as far off as ever from the ultimate knowledge of how this fibrin-ferment should cause fever, even if it does, as the authors just mentioned affirm, produce a capillary embolism by coagulation of the blood. Besides, of the existence of this capillary embolism no really satisfactory proof to our mind is brought.

The aseptic fever of Volkmann, noticed after subcutaneous contusions, after simple fractures and the like, is considered to be due to the absorption of the products of the extravasated and disintegrating blood.

It would seem that while pyæmia is produced, as far as we now know, by but one kind of bacterium, septicæmia and suppuration may be due to various kinds.

Ogston and others have constantly found micrococci in the pus of acute abscesses, even in those in which no communication with the air could be discovered. This pus, injected under the skin of guinea-pigs and mice, caused symptoms of blood-poisoning, followed by a local abscess, in which, and in the blood of the affected animals, numerous micrococci were found. No metastatic pyæmic abscesses were found, and the animals usually recovered after the lapse of five to seven days. These micrococci, Ogston observed, were usually grouped together in clusters or in chain-form, and they preserved these arrangements when artificially cultivated. Pasteur found a micrococcus in furuncles, which, when injected under the skin of animals, caused suppuration there, though injected into the blood-vessels it proved harmless.

Some kinds of bacteria may exist in wounds without causing any suppuration, for such have been found by Cheyne, in wounds running an entirely aseptic course, and the writer has frequently

observed in the water-blisters produced on the hands by rowing or other exercises where the skin is chafed, that the fluid contained in them is full of micrococci, although no visible communication exists with the air. Here the micrococci evidently must gain entrance by perforating the epidermis. Every one of us must have had such blisters at one time or another, and yet we all know that they do not go on to suppuration.

A great deal of interest has been shown in the question as to whether putrefactive bacteria may not pre-exist in the blood and tissues of normal animals, and many experiments have been made to settle this point. The result of most of these experiments was to indicate quite strongly that these bacteria really did pre-exist, when the positive experiments of Meissner, as detailed by Rosenbach, in the *Deutsche Zeitschrift f. Chirurgie*, vol. xiii, 1880, threw them all into the shade. Meissner, by filtering the air and water in which he kept the various tissues taken from living animals, was able to preserve the latter entirely undecomposed, and without the aid of any disinfecting chemicals whatever, for an indefinite length of time—up to two years. Such positive experiments are worth any number of negative ones.

It is a universal experience that one attack of an infectious disease, as measles, scarlet-fever, small-pox, etc., gives immunity to subsequent attacks. The reason for this is not clear. The opinion has been advanced, that the bacteria, to which the infectious diseases are due, by their growth in the body remove from it that certain something which forms a suitable soil for their propagation, and that this is not reproduced. In view of the fact that the constituents of the body are so constantly undergoing changes, the old being replaced by the new, this idea seems hardly tenable ; still, as yet no better hypothesis has been offered.

The preventability of infectious diseases is a subject that, from the very beginning of our knowledge of disease germs, has occupied the attention of investigators, and has, in their hands, met with a great deal of success. The methods employed are two. The first seeks to exclude the germs entirely from entering the

system and gaining a foothold there : The second endeavors, by the inoculation of a "mitigated virus," to produce a mild form of what would otherwise be a severe, perhaps fatal, disease ; this mild form, however, having the same effect as the severe one, of giving immunity—for some time at least—to subsequent invasions of the germ. In the first category are embraced all quarantine and hygienic regulations generally, as applied to communities ; and, to individuals, the Listerian treatment of wounds. In Listerism—and by that term we do not mean merely an observance of the details of gauze, carbolic acid, macintosh, rubber protective, spray, etc., etc., that go to make up a "Lister dressing," but the application of disinfection to wounds in its widest sense, whether with chemicals or without,—in Listerism, we say, we have a recognition of the fact that the unhealthy suppuration of wounds, and its bad after-effects upon the body, are due to the presence of bacteria in the exposed parts, and the absorption from the latter either of the germs themselves into the body, or the products of their growth, which act as a poison on the tissues. Inoculation of small-pox has been practised in China from the very earliest ages, but it was not till 1717 that Lady Mary Wortley Montagu introduced it into England, where, after much opposition, it became popularized, only to be superseded by vaccination, first employed by Jenner in 1796. The method pursued in inoculation was to take the virus from the pustule of a small-pox patient after the eighth day, and to introduce this beneath the skin of the person to be inoculated. The disease which followed resembled ordinary small-pox, excepting that it was much milder in degree ; like it, too, it was characterized by a general eruption. Jenner, already in 1770, communicated to John Hunter his observation, that persons infected with cow-pox from milking affected animals, remained exempt from small-pox, but it was not till 1796 that he actually practised vaccination on a child. The subsequent progress of vaccination is too well known to need further comment.

In the past few years, Pasteur, Toussaint, Chauveau, and others, chiefly of the French school, have given much attention to the

prevention of anthrax, chicken cholera, and some other infectious diseases affecting animals. Their idea has been to render by various ways the bacteria less active in their manifestations than before, while yet retaining enough vigor to grant immunity against attacks of the unchanged plant. Pasteur's mode of "attenuating" the anthrax bacillus is to keep it permanently at a temperature of  $42^{\circ}$ – $43^{\circ}$  C. in neutralized chicken-broth. Its vitality is thus gradually lowered, till at about the end of a month it dies. By using the cultivations at different times within this period different degrees of intensity may be reached. Pasteur claims that the bacillus undergoes an actual physiological modification, but whether it does so or not is still a disputed point with mycologists. Some assert that its effects are due simply to dilution, for the same effects have been produced by using for inoculation a highly diluted virus. When we remember that in the body the anthracis bacilli do not go on to the formation of spores, and multiply only by fission, and this to a not unlimited extent, it seems plausible enough to suppose that a few bacilli would produce symptoms less severe than if many were introduced into the system. On the other hand, the decrease in the virulence of epidemics toward their close, indeed, the fact that they cease at all even when there are plenty of unaffected individuals about, would seem to be a point in favor of a physiological change,—a certain decrepitude, so to speak,—gradually overtaking the later generations of the germs. Again, in vaccine and in small-pox, we seem to have another evidence pointing strongly to modification by soil. Cow-pox inoculated on man gives immunity against variola. The contents of a true variolous pustule from a human being, on the other hand, inoculated on a heifer, produce cow-pox, which, however, in turn produces the latter disease again in man.

While the cause, therefore, is yet to be settled, the fact nevertheless remains that the inoculation of cattle has been successfully practised on a large scale in France, Germany, Hungary, Holland, the Cape of Good Hope, etc., both for anthrax, pleuropneumonia, and tagsore (variola of sheep). It does not, however,

give perfect immunity in all cases, especially from infection by way of the alimentary canal. Extensive experiments are being carried on at the present time which will, no doubt, throw more light on this question, so highly important from an economic point of view.

In the past year and a half the most important discovery announced in mycology is that of the *bacillus tuberculosis* by Koch, who in a comprehensive series of experiments that have since been widely repeated, demonstrated that the disease tuberculosis is due to the invasion of the body and the growth in it of a bacillus. Koch's discovery was the last link in the chain needed for the absolute proof of the bacterial origin of tubercle, for the experiments of many observers, notably Cohnheim, had shown that it was a truly infectious disease, due most undoubtedly to an organized inoculable virus.

The presence of bacteria of one form or another has been demonstrated in a number of diseases besides those already mentioned, as erysipelas, gonorrhœa, syphilis, lepra, malaria, typhoid and recurrent fevers, measles, etc., etc., but only in a few of them has the absolute dependence of the disease on the presence of the bacterium been demonstrated. Many difficulties lie in the way of affording this proof, chief of which are the inability to cultivate the germs outside of the body, and the insusceptibility of animals in whom they are inoculated. Thus gonorrhœal micrococci, cultivated in sterilized media through several generations, while producing a most unmistakable clap when introduced into human urethræ, prove harmless to animals.

When we review all the facts relating to the germ theory of disease, a brief outline of which we have attempted here, it seems to us that the odds are overwhelmingly in its favor; that by it conditions are explained for which there is no other satisfactory solution; and that it casts a clear light on questions which have baffled all previous investigation. It will, of course, like the theory of evolution, be combated for a number of years to come, especially by the strongly conservative members of the profession, who find it hard to throw off the traditions of years, but Time, which healeth all things, will cure this disposition too.

WALTER MENDELSON.

## NEW BOOKS AND INSTRUMENTS.

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**Bacteria and the Germ Theory of Disease.** Eight lectures delivered at the Chicago Medical College by Dr. H. GRADLE, Prof. of Physiology, Chicago Medical College, Oculist to the Michael Reese Hospital. 8vo, pp. 219. Chicago: W. T. Keener, 1883.

**On the Relations of Micro-organisms to Disease.** The Cartwright Lectures delivered before the Alumni Association of the College of Physicians and Surgeons, New York, February 19, 21, 24, and 27, 1883, by WILLIAM T. BELFIELD, M.D., Lecturer on Pathology, and on Genito-Urinary Diseases (Post-Graduate Course), Rush Medical College, Chicago. Reprinted from *The Medical Record*, February and March, 1883. 12mo, pp. 131. Chicago: W. T. Keener, 1883.

We have elsewhere<sup>1</sup> given a review of the contents of both these excellent little books, which we can cheerfully recommend to those who wish to obtain a good insight of the bacterial question as it stands at the present time. Of the two, that of Dr. Gradle is perhaps to be preferred, as it is fuller, and more systematically arranged than the other, and contains numerous references in foot-notes. It is a pity that Dr. Belfield's lectures, when prepared for the press, to be published in book-form, were not subjected to a more thorough revision, especially in the matter of giving references, etc. On the other hand they are furnished with numerous engravings of photo-micrographs from the originals of Koch, which are highly instructive and interesting.

One thing we cannot too strongly deprecate in this work, and that is the tendency to hold up to ridicule and scorn any one who does not happen to agree with the opinions of the author. A just criticism and searching analysis, when honestly meant and fairly

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<sup>1</sup> See Editorial on "The Germ Theory of Disease," on page 176 in this number of the *ARCHIVES*.

conducted, even though they should be wrong in effect, are proper and legitimate, and further science by provoking discussion and ultimate correction. But a sneering tone, and ridicule, and irony, when criticising another's work, is as unwise as it is unjust, for none but the shallowest mind could be warped in its consideration of a scientific research by the fun poked at it by an adversary, and one should have very good proofs before intimating that another seeks wilfully to repress facts. Nor need a man be necessarily an ignoramus because he does not know all that has gone before in his line of study. Ridicule is no argument, and irony no proof.

**Photo-Micrographs and How to Make Them.** Illustrated by Forty-seven Photographs of Microscopic Objects, Photo-Micrographs, Reproduced by the Heliotype Process, by GEORGE M. STERNBERG, M.D., F.R.M.S., Major and Surgeon U. S. Army, Member of the Biological Society of Washington, Honorary Member of the Microscopical Societies of Baltimore and of San Francisco, Fellow of the American Association for the Advancement of Science, etc., etc. 8vo, pp. 204. Boston: James R. Osgood & Co., 1883.

Within the last year or two amateur photography has come greatly into vogue, and while for many it is a mere pastime intended only for amusement and the reproduction of favorite scenery or other objects, for the professional man it has become of really great and permanent use in his work. Physicians are largely employing it for recording the appearances of interesting cases. Photographs taken of the same patient from time to time serve as a means of comparison between different states, and thus new elements of accuracy are introduced.

With the improved and convenient apparatus now manufactured by numerous reliable dealers, any physician can, at a moderate outlay of cost, become his own photographer, and thereby add greatly to the interest and value of many of his clinical histories.

In the work under consideration Dr. Sternberg, whose contributions to mycology are well known, has sought to popularize the photographing of microscopic objects, and has given us a book in which various methods are described, and the difficulties liable to be met with pointed out. The book, as the author states in the preface, is intended for beginners and not for such as are anxious to attempt the more difficult feats of photo-micrography. It is divided into two parts, in the first of which the technology of

photo-micrography is treated of, while the second is devoted to a description of the series of heliotype plates with which the work is furnished. Under the heading of technology is embraced a very complete consideration of the subjects of light, microscopical and photographic apparatus with their arrangement, the fitting up of an operating-room, or, when this is not procurable, of an arrangement for use in an ordinary room; the projection, focussing, and measuring the object upon the screen; the development of the negatives, with formulas and directions for manipulating the different chemicals used, and the methods of making positives on glass. This is followed by a consideration of the objects most suitable for photographic reproduction, and the best methods for preparing and mounting them to that end.

The second part of the work is taken up with a description of the forty-seven heliotypes, illustrating various animal and vegetable tissues, and the lower forms of plant and animal life.

There is so much useful information in the book that we can only regret that it was not made a little fuller by more detailed explanations of the uses of various kinds of apparatus used. The author is evidently accustomed to work with one of the rather complicated forms of English instruments, provided with numerous "accessories" of all sorts,—accessories which any one brought up in the German school of microscopy (and we venture to say that this is the most popular in this country) knows hardly any thing about. By a little more labor in preparing the text, and by the help of a few outline drawings of apparatus, we are sure the work would gain greatly in value. Nor should an account of the process of making silver prints have been omitted.

Many of the heliotypes are highly instructive, but in the explanatory text there are several errors of reference which are rather disturbing. Thus, on page 38, plate xi is referred to when plate xv is really meant. On page 103, fig. 2 of plate iii is spoken of and described as the epithelial cell from the mouth of the frog, while on page 101 it is correctly given as the *Euglena viridis*, and we have nowhere been able to find any representation of the epithelial cell referred to. On page 107, reference is made to plate i, fig. 2, as an example of the use of the photographic method in cases in which parasitic organisms are present in the blood, whereas the plate referred to forms the frontispiece of the book, representing the arrangement of the various apparatus for photographing. Plate ii, fig. 2, is probably what is meant. These

are the errors which we have happened to come across without especially searching for them. They are annoyances which a more careful proof-reading would do away with.

In looking over the series of plates we are impressed with the fact that photo-micrographs will be most useful to those already quite familiar with the appearance of the objects represented, and we do not think they are as yet calculated to supersede a carefully and intelligently made drawing prepared by the microscopist himself. Too often the drawings for our text-books are made by draughtsmen, skilful enough with the pencil, but knowing nothing of the nature of what they are drawing. So errors slip in which a microscopist would not make. A beginner, we are sure, will be helped more by a well-made drawing than by a photograph, while the latter will be of more satisfaction to the well-versed microscopist. The two must supplement each other.

Of the plates, plates v and vi, representing different specimens of blood, strike us as being particularly good, the shape of the disks being very distinct, and all the details sharp and clear, though the magnifying power is as high as 1450 diameters.

The book is excellently printed on exceptionally heavy paper, and plainly but substantially bound. [W. M.]

## ORIGINAL OBSERVATIONS.

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### CASE OF GENERAL NEURALGIA.\*

By J. T. ESKRIDGE, M.D.,

PHYSICIAN TO ST. MARY'S AND JEFFERSON MEDICAL COLLEGE HOSPITALS, PHILADELPHIA.

Gotlieb B., German, æt. twenty-nine, married, laborer in an iron-foundry, denies ever having had any venereal disease. No cicatrices are found on his penis, and his three children are well developed and healthy in appearance. His father, who suffered from some supposed inflammatory spinal trouble, is dead. His mother, still living, complains of great pain in the abdomen. His hair is not well preserved, the top of his head being nearly bald, and the sides rather sparsely covered with dark curly hair. His skin is thin and of a reddish hue. He is short, rather stout, and has a nervous, irritable appearance. He enjoyed good health until the year 1873, when he suffered from an attack of left-sided pneumonia, which confined him to his bed four weeks.

Two years ago, after sleeping one night in a damp bed, he noticed a dull, heavy pain in the dorsal and lumbar regions of the spine. After the spinal trouble had continued about one month, or until May, 1881, it became complicated during the next month by a very painful condition of the left sciatic nerve. During these two months, although he was scarcely able to stand erect, and locomotion was very painful and exceedingly difficult, he managed daily to hobble to and from his work, a distance of several squares, and was compelled to stand on his feet about ten hours each day. The following summer he was able to walk quite well, although a little pain was experienced when the left sciatic nerve was firmly pressed upon. In October, 1881, melted hot iron fell in his left shoe and burned his ankle severely. The scar is rather superficial, and extends from an inch behind the internal malleolus over the instep to a point about the same distance behind the external malleolus. The burn was most superficial, but its area greatest

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\* A paper read before the American Neurological Association, June 20, 1883.

around the internal malleolus ; on the outer aspect of the ankle the area was small, but the wound extended to the bone. The scar over the instep is about three fourths of an inch in width. From the effects of the burn he remained in the University of Pennsylvania Hospital eleven weeks. After leaving the hospital comparatively free from suffering, he returned to work, but one week later he began to experience great pain in the left leg and ankle. This attack lasted about one month, and the pain was greatly relieved by pressure over the sciatic nerve as it emerges from the pelvis. During the next ten months he suffered more or less, but was able to work. In October, 1882, he was admitted into the nervous wards of the University Hospital, and remained there five weeks, suffering from severe pain—which extended from the lumbar region down the posterior portion of the thigh and leg to the left foot. At that time the pain was most intense in the ankle. He improved slightly while in the hospital, but soon after returning to work his condition became worse than it had been at any previous time.

He was admitted into the medical wards of the St. Mary's Hospital, January 15, 1883. On admission he was scarcely able to walk, complained of great pain in leg and back ; sleep was broken, appetite capricious, and bowels constipated ; temp. 100° ; pulse 92 ; resp. 24. The spine was very tender on pressure in the dorsal and lumbar regions. All the superficial nerves of the left leg, thigh, and gluteal region were the seats of neuralgic pain, and light pressure over any portion of the affected nerves greatly augmented his sufferings. The scar around the ankle was probably a little more sensitive than other portions of the neuralgic area. Absolute rest in bed was enjoined, counter-irritation was made from time to time over the spine and left sciatic nerve, and most agents of repute in the treatment of neuralgia and rheumatism were tried in various combinations, but nothing, except hypodermic injections of morphia and atropia, seemed to afford much relief, and the effect of these medicines were decreasing, and never more than temporary. Chloroform injections appeared to increase rather than lessen his suffering. Early in February, the internal saphenous and genito-crural nerves of the left side became the seats of severe neuralgic pain. The left side of the scrotum was red, burned like fire, and was so tender that he complained bitterly when the part was touched. The scrotum on the right side of the median line was normal in appearance and entirely painless. The disease had extended up the spinal

cord and involved the brachial plexuses, first of the right side, then of the left. Double dorso-intercostal neuralgia soon became well established, and nearly constant. Left dorso-lumbar neuralgia was complained of, but not to as great an extent as the dorso-intercostal. Of the five foci mentioned by Anstie as characteristic of true neuralgia of the superficial branches of the lumbo-abdominal nerves, the vertebral, abdominal, and scrotal points were well marked on the left side; the other two, though present, were so slight as to be easily overlooked. Extension was made upon the leg by means of pulley and weights, for an hour every night and morning, but relief, although almost complete at first, gradually grew less and less, until after the lapse of two or three days, when each time the apparatus was applied, it invariably increased his sufferings after it had been on a few minutes. The increased pain was thought to be due to the adhesive plaster irritating the sensitive cutaneous surface of the leg. During the latter part of February, after etherizing the patient, the sciatic nerve was stretched by forcibly flexing the thigh upon the body, the leg being at the same time extended. After the effects of the ether had passed off, hypodermic injections of morphia had to be resorted to to relieve pain which had greatly increased after the operation. The next few days the patient's suffering greatly increased, the pain in the leg and lumbar region having become constant and very intense. Repeated injections of full doses of morphia several times during the twenty-four hours were found necessary to make life tolerable. By the early part of March he had become exceedingly nervous and somewhat hysterical, every thing seeming to irritate him. His appetite was poor, he was losing flesh, and his bowels alternated between diarrhoea and constipation. At that stage of the disease he frequently complained of palpitation of the heart, and pain in the præcordial region.

As cod-liver oil, iron, strychnia, arsenic, quinia, and various other remedies had been used without securing much relief to the patient, and as the hospital possessed neither a galvanic nor faradic battery in working condition, it was determined to suspend all other remedial efforts, and resort alternately to cold and hot applications to the spine and painful sciatic nerve. Bladders filled with ice, and rubber bags with hot water, were alternately applied every five minutes, for an hour each day. During the first week of this plan of treatment, when it was faithfully carried out and personally superintended by the resident physician, Dr.

Moylan, the pains greatly lessened, no morphia being required, and the patient's appetite and general condition improved. Subsequently the treatment by cold and hot applications had to be trusted to the male attendants. It was not long, however, before the wards of the hospital became so crowded that the attendants found it impossible to give proper attention to this rather troublesome plan of treatment, and in consequence, sometimes the ice, as well as the hot applications, was allowed to remain in contact with portions of the body from fifteen minutes to half an hour. As might be expected, he was chilled by the ice. His neuralgic pains returned, and began to be felt in nerves that before had been free from pain. About that time the three divisions of the right fifth cranial nerve were attacked, and soon became very sensitive and acutely painful, although the nerves on the left side of the face were free from pain, and have remained so up to the present time. As soon as it was found to be impossible to have the hot and cold applications changed as frequently as was necessary, this plan of treatment was abandoned. It may be stated that the object of this treatment was to modify the nutrition of the parts by rapidly changing the state of the circulation.

By the middle of April, the man could walk slowly about the wards of the hospital. At that time he was not suffering much pain, except for a day or two prior to decided changes from high to low barometric pressure. Most of the larger superficial sensitive nerves were painful on pressure, the left fifth cranial nerve alone having escaped. On April 12th, he first experienced slight pain in the right sciatic nerve. This nerve became painful soon after a mild faradic current had been applied for the purpose of testing the electro-muscular contractility. On a few occasions since, he has had slight pain in the right knee, but the right sciatic nerve does not now (June 6th) seem to be generally involved. The sensibility of the skin involved by the burn was increased on the outer side of the foot, but other portions of the cicatrix were not more sensitive than the general cutaneous surface of that leg.

Electro-muscular contractility was well preserved, and about equal on both sides of the body.

Electro-sensibility was increased in the left leg and in both arms. Condition of special senses :

Taste : right side normal ; left side impaired, especially for sugar.

Smell : " " " " " not so acute.

Hearing : " " good ; " " good, and equal to the right.

Sight : " "  $\frac{2}{10}$  ; " "  $\frac{2}{10}$  (?)

May 27th.—During the last five weeks he had been treated exclusively once or twice weekly by means of electricity. The faradic current had been used most of the time, but on a few occasions the galvanic had been employed. For more than two months, with a few exceptions, the man's general condition had been gradually improving, the pains had lessened in severity and frequency, he had gained several pounds in weight, was then able to walk a mile or more without resting, and did not find much difficulty in doing light work. The girth of various portions of the arms and legs had been measured from time to time, but no wasting of groups of muscles had been observed at any time.

May 31st.—After carrying a large basket filled with marketing on his back, a distance of several hundred yards, a few days before, rather sharp pains were experienced in the lower lumbar region of the spinal column, and in the upper portion of the left sciatic nerve. Several points of tenderness were observed over superficial nerves, around the left knee, in the left groin, in the arms, and over branches of the right fifth cranial nerve. At that time pain was severe and constant in the left popliteal region, but it could be almost entirely relieved for the time by a strong faradic current continued for several minutes.

June 4th.—My friend, Dr. C. K. Mills, kindly examined the patient with me. It was noted that electro-sensibility was greater in the right leg than in the left. In the right leg the current passing through the electric brush was felt with a half inch of secondary coil, and in the left it was not observed until one inch of the secondary coil was used.

Good faradic contractility was found in the muscles of both legs.

On using the galvanic current, no reactions of degeneration were detected.

The patellar, cremaster, and iritic reflexes when investigated were always found to be normal.

#### CUTANEOUS SENSIBILITY AS TESTED BY THE ÆSTHESIOMETER.

	April 11, 1883.		May 22, 1883.	
Tip of great toe . .	R. 12 mm.	L. 17 mm.	R. 10 mm.	L. 13 mm.
Dorsum of foot . .	R. 41	L. 48	R. 40	L. 60
Skin over anterior				
surface of tibia . .	R. 35	L. 57	R. 55	L. 48
Popliteal space . .	R. 38	L. 70	R. 35	L. 40
Inner side of knee . .	R. 23	L. 37	R. 25	L. 22

Outer side of knee . . . . .	R. 32 mm. ; L. 32	R. 31 mm. ; L. 29
Anterior thigh . . . . .	R. 50 L. 59	R. 60 L. 55
Groin . . . . .	R. 39 L. 54	R. 58 L. 58
Scrotum . . . . .	R. 45 L. 64	R. 45 L. 60
Outer side of thigh . . . . .	R. 52 L. 55	R. 50 L. 45
Post. side of thigh . . . . .	R. 56 L. 74	R. 70 L. 70
Inner side of thigh . . . . .	R. 45 L. 48	R. 46 L. 60
Upper gluteal region		R. 14 L. 32
Lower gluteal region . . . . .	R. 45 L. 58	R. 39 L. 36
Lumbar region . . . . .	R. 64 L. 90	R. 52 L. 48
Dorsal region . . . . .	R. 82 L. 89	R. 57 L. 64
Post. cervical region . . . . .	R. 52 L. 52	R. 57 L. 52
Lateral cervical " . . . . .	R. 48 L. 55	R. 55 L. 45
Abdominal " . . . . .	R. 32 L. 38	R. 25 L. 30
Lateral costal " . . . . .	R. 52 L. 55	R. 35 L. 28
Anterior " " . . . . .	R. 52 L. 44	R. 38 L. 44
Tips of fingers . . . . .	R. 10 L. 15	R. 10 L. 14
Palm of hand . . . . .	R. 32 L. 25	R. 25 L. 18
Dorsum of hand . . . . .	R. 29 L. 35	R. 32 L. 32
Anterior surface of forearm . . . . .	R. 35 L. 35	R. 32 L. 45
Posterior surface of forearm . . . . .	R. 54 L. 48	R. 32 L. 29
Inner side of elbow . . . . .	R. 52 L. 38	R. 29 L. 32
Outer side of elbow . . . . .	R. 45 L. 43	R. 52 L. 38
Anterior brachial region . . . . .	R. 54 L. 52	R. 61 L. 38
Skin surface of lower lip . . . . .	R. 35 L. 32	R. 29 L. 25
Cheek and side of nose . . . . .	R. 32 L. 22	R. 29 L. 32
Forehead . . . . .	R. 35 L. 32	R. 38 L. 32

SURFACE TEMPERATURE OF VARIOUS PORTIONS OF THE BODY  
COMPARED.

	April 11, 1883.	May 31, 1883.
Axilla . . . . .	R. 99.1°; L. 99.1°	R. 98.6°; L. 98.6°
Calf of leg . . . . .	R. 93.2°; L. 92.4°	R. 94.8°; L. 94.6°
Inner thigh . . . . .	R. 97.6°; L. 96.5°	R. 97.4°; L. 97.3°
Upper posterior thigh . . . . .	R. 97.4°; L. 96.5°	R. 97.6°; L. 98.3°
Lumbar region . . . . .	R. 97.2°; L. 96°	R. 96°; L. 96.8°
Cheek . . . . .	R. 96°; L. 97.2°	
Posterior frontal region of head . . . . .	R. 96.9°; L. 97.4°	R. 96.6°; L. 96.8°
Over cerv. vertebræ . . . . .	94.6°	
Over upper dorsal vertebræ . . . . .	96.4°	
Over lower dorsal vertebræ . . . . .	96.3°	

Over lumbar vertebrae 96.1°

Parietal station of

head . . . . .

R. 96.9°; L. 96.6°

June 6, 1883, special senses remain about the same as found April 11th.

*Tactile sensibility.*—On April 11th, thirty-two comparative æsthesiometric observations were made. Fifteen corresponding bilateral stations were selected on the lower limbs, extending from the great toe to the lumbar region. In fourteen of these stations, the two points of the æsthesiometer were recognized when they were from three to thirty-two millimetres nearer to each other on the right or healthy side than on the affected side, the average of the differences having been a little more than thirteen millimetres.

Over the three main branches of distribution of each fifth cranial nerve, three corresponding bilateral stations were selected for comparison,—one station on the cutaneous surface of the lower lip, one on the cheek and side of nose, and one on the forehead. The two points of the æsthesiometer were recognized when they were from three to ten millimetres nearer to each other over the left or healthy nerve than over the affected nerve, the average of the differences having been about five millimetres.

On the outer side of each knee the two points of the æsthesiometer were recognized at equal distances.

The other fourteen comparative observations, noted on that day, were made at corresponding bilateral stations over various portions of the trunk and upper extremities, parts of the body affected by bilateral neuralgic pains. Over these parts the sense of touch was better on the right side at six stations, on the left at six, and equal on both sides at two. The averages for the two sides were equal.

The sense of pain was more pronounced in the neuralgic areas, or where the sense of touch was diminished.

On May 31st, about fifty days after I had made the æsthesiometric observations which I have given in detail, during which time the patient had improved as stated in a former portion of this paper, I repeated my observations on his sense of touch, selecting, with one exception, the same bilateral corresponding stations employed April 11th. Of the latter series of thirty-two observations, the sense of touch was better on the right side thirteen times, on the left sixteen, and equal on both sides three times.

At that time it was observed that wherever comparative tactile sensibility was diminished, the sense of pain was lessened. This relation of pain and tactile sensibility was just the reverse of what had existed nearly two months before. No anæsthetic zones or areas were detected at any time.

*Surface temperature.*—On April 11th, when the temperature in each axilla was  $99.1^{\circ}$ , six comparative bilateral surface-temperature observations were made. The temperatures, without a single exception, were a little lower in the neuralgic than in the corresponding portions of the opposite or healthy side of the body, the difference having varied from a fraction of one degree to one and a half degrees. Over the lumbar and dorsal regions of the cord the temperatures were about two degrees higher than over the cervical region. The greater portion of this discrepancy of the temperatures over various parts of the cord may be accounted for, I think, by the cervical region having been exposed, while the lumbar and dorsal were well protected by covering. The man was in bed when the observations were made.

On May 31st, the comparative bilateral surface-temperature observations were repeated, and the temperatures found to be nearly the same on both sides of the body.

The diagnosis of the case that I have described in this paper was exceedingly difficult during some stages of the disease. At one time I thought that the chief symptoms pointed very strongly to spinal congestion or inflammation, followed by diffuse descending neuritis. Later, when the patient was improving, I was inclined to regard the disease as one of general neuralgia. About the middle of last April, I gave a short account, which has not been published, of the case, calling it general neuralgia, before a clinical meeting of the Philadelphia County Medical Society. The neurologists present at the meeting were divided in opinion: some thought the affection was general neuralgia; others were inclined to view it as one of polio-myelitis followed by diffuse descending neuritis.

The trouble having commenced in the lumbar region of the cord after the man had slept one night in a damp bed; its spreading to the sciatic nerves; the extension of pain up, and involving the greater portion of, the spinal cord and all the nerves of the brachial plexuses, when taken in connection with patient's deplorable condition at one time, and with the fact that the part first attacked—the lumbar portion of the cord—was, until a few weeks ago, the seat of great and constant pain, and very sensitive to

pressure and the passage of a mild faradic current, suggest the inquiry : Has not the case been one of general neuritis following inflammatory spinal trouble, and improved ?

In favor of general neuralgia it may be stated :

1. That we have a disease that has extended over a period of more than two years, made up of attacks of pain lasting from two to six months, in a man whose condition and general appearance to-day seem to be as good as they were after the first attack in the year 1881.

2. That several times, by firm pressure over the great sciatic nerve as it emerges from the pelvis, he had succeeded in relieving pain in the foot and leg.

3. That in inflammatory conditions of the cord of so long duration reactions of degeneration and other atrophic disorders would probably be found, and improvement, if it should occur, would be slower and less complete than it has been in the present case.

4. That the left leg and right fifth cranial nerve were severely affected, while the left side of the face entirely, and the right leg almost entirely, escaped.

5. That pain was often shooting or stabbing in character, differing from the dull ache of neuritis.

Could not the case have had a syphilitic origin, and the inflammatory exudation have disappeared, leaving the man in his present condition ? Against this view certain facts militate. When the patient first came under my care, he was promptly put upon anti-syphilitic treatment ; and, notwithstanding the treatment was continued for a number of weeks, he grew worse instead of better. He did not begin to improve until after this plan of treatment had been abandoned more than a month. No anæsthetic zones or areas, such as have been pointed out as occurring in cases of syphilitic neuritis, were observed at any time.

(After the paper was written for the Association, pustular eruptions developed along the course of the superficial nerves of the arms and upper portions of the chest. Also a severe neuralgic condition of the coccyx had supervened.)

July 14, 1883.—The man's general condition remained about the same as it was in the early part of June. Some days he was entirely relieved of pain, but at other times he suffered considerably. Galvanic and faradic currents were discontinued in his treatment, and static electricity was solely employed, from twenty to thirty minutes, almost daily for two weeks. After the second

séance he was free from pain and remained so during the remainder of July, when he left the hospital to engage in work in an iron-foundry.

Aug. 27th.—During the last three weeks he has been able to work daily in the foundry. He occasionally suffers from twinges, especially just before sudden changes in barometric pressure, but still he is so comfortable that he considers himself quite well.

## ANNOUNCEMENT.

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The editors of this Journal regret to be obliged to announce its discontinuance after a satisfactory existence of five years. During this time the plan announced in the prospectus—of presenting to the reader only original material—has been persistently and, it is believed, successfully prosecuted. The suspension is rendered necessary, not from lack of support by contributors or subscribers, but through a combination of extraneous circumstances.

The editors wish hereby to express their grateful thanks to the collaborators whose work is embodied in the ten volumes of the ARCHIVES, to the profession which has so liberally supported it by subscriptions, and to the publishers for the care which they have bestowed upon the publication, and for their unvarying courtesy to the editorial staff.



# ARCHIVES OF MEDICINE.

## Original Articles.

### ON THE RELATIVE IMPORTANCE OF ELEVATION, DRYNESS, AND EQUABILITY OF TEMPERATURE IN THE CLIMATIC TREATMENT OF PULMONARY CONSUMPTION.

By J. HILGARD TYNDALE, M.D.,  
NEW YORK.

SAID Laennec: "Of all the means hitherto recommended for the cure of phthisis, none have been followed more frequently by complete cessation of the disease than change of climate." The value of a change of climate from the one where the patient resided to one of different attributes, has been more or less recognized since the days of Hippocrates. Such changes were made arbitrarily from continental to marine climates, or from cold to warm, by changing latitude; always governed by the sensations of the patient. If from time to time climato-therapy has completely fallen into disrepute, it is solely owing to the bad results attained, and these again are entirely due to the wrong method of choosing, according to the inclinations and sensations of a patient.

For the last two decades meteorological observations and climatic treatment of consumption have taken a new lease of life. Without going into detail, let me briefly state the facts. Hygrometrical, barometrical, and thermometrical observations now carried on in every civilized country of

the earth, have established that the three prime constituents of climate are: dryness, elevation, and equability, which constituents of climate were up to that time subordinated to the mean degrees of temperature of the air—warmth and cold. A vast majority of physicians prescribed *uniform warmth*; and though this means warmth with equability throughout the year, it was the warmth which was chosen as the therapeutic agent to suit the patient's sensitiveness of skin and respiratory mucous membranes. To uniform warmth, equability was subsequently added as a requisite, (a small range of temperature throughout a season,) and the leading idea of this school was, and is to-day, to give the patient the benefit of almost continuous out-of-door life; the benefits claimed being, as I have said, *equable warmth* with *abundance* of sunshine.

Stress is here laid upon "abundance," as it is desirable to remember for what follows, that abundance and intensity are two different features.

Warmth as the prime factor was the sequel of Broussais' teaching of laying greatest stress upon the inflammatory nature of consumption.

Such a climate is found upon islands in mid-ocean and on the sea-coast in the torrid zone, and the southern latitudes of the temperate zone (Madeira, Bahama Islands, Sandwich Islands, coast of Florida, Malaga in Spain, etc.), and to them patients were directed with subsequent bad or indifferent results.

In 1871 James Henry Bennett<sup>1</sup> strongly advocated tonic, stimulating climates, as against the above sedative ones, based upon reasoning and some favorable results. By "stimulating" Bennett means tolerably uniform coolness, an absence of excessive moisture and a fair modicum of

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<sup>1</sup>"On the Treatment of Pulmonary Consumption by Hygiene, Climate, and Medicine," by James Henry Bennett, M.D.

sunshine; in other words, coolness and moderate dryness.

It is since the return to England of the late Dr. Archibald Smith from the Peruvian Andes that attention has been drawn to *elevation* (high altitude) as a healing factor. This was supported by the experiences and writings of Jourdanet, the experiences of Brehmer in Goerbersdorf at his sanitarium, Fuchs, Kuechemeister, Herman Weber, and Lombard.<sup>1</sup>

In part the benefits attained were credited to reduced pressure of the air-column at high altitude alone; in part the decrease of humidity (relative dryness) with increasing elevation was noted. Coupled to elevation and dryness were found to exist abundance and intensity of sunlight, and cool or cold temperature. These constituents of climate are at the present time engaging the attention of pneumonologists in England, Germany, and France. Drs. Williams, Weber, Yeo, of London, and Brehmer, Dettweiler, Kuechemeister, Schreiber, and others, in Germany, have noted and published results.<sup>2</sup> How we stand in this country will be seen later on.

What, now, is climate? Climate is the embodiment of some fixed elements of soil, relating to composition and physical aspect, and of the atmosphere; the interchanges among the constituents of which are termed meteorological conditions, and form an ever-shifting panorama in the sea of air surrounding our globe.

The chief constituents of climate are:

1. Barometric pressure—the pressure of the air-column at sea-level or elevations.

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<sup>1</sup> Lombard, "Les Climats de Montagnes"; Archibald Smith, *Edinburgh Medical and Surgical Journal*, 1840; "Le Mexique et l'Amérique Tropicale, Climate, Hygiène, et Maladies," D. Jourdanet; Herman Weber, *Medico-Chirurg. Transactions*, vols. 3 and 52.

<sup>2</sup> "Health Resorts," by Burney Yeo, M.D., 1882; Brehmer: "Die chronische Lungenschwindsucht," 1879; Dettweiler: "Behandlung der Lungenschwindsucht," 1882; "Davos Platz," by Alfred Wise M.D., 1881.

2. Temperature—the monthly and annual averages of degrees of heat, and the diurnal, monthly, and annual range, by which the fluctuations of temperature are noted ; permitting us to judge of its *equability*.

3. Humidity—the relative quantity of vapor in the atmosphere as compared to the standard of saturation, which is called 100%. Absolute humidity, by which we learn of the *real* quantity of vapor in a given space, is in reality of greater interest and importance.

These three constituents—the weight of the air-column, differing at various elevations ; equability of the temperature, according to greater or lesser number of degrees covered by the mercurial column in a given time ; and the relative dryness of any region, different degrees of moisture-saturation of the air—are the main elements, and their fluctuations within certain limits of time and intensity are the features of the various climates. The degrees of temperature (hot, warm, cool, and cold), aside from their fluctuation, are only to be named as an appendix to one or more of the other factors, to express the sensation experienced by the human organism : a fact which I am trying hard to have recognized.

The other constituents partly resulting and dependent upon them are :

1. Intensity and abundance of sunlight—intensity dependent upon the purity and rarity of the atmosphere—its diathermancy, or capacity for transmitting rays. The number of clear days in a month or year bear evidence as to the abundance of sunshine. Abundance, therefore, denotes the *quantity* of sunlight, and is found in company with both equable and dry climates. Intensity denotes the *quality* of sunlight, and is associated with dryness, more particularly at altitudes.

2. Winds—the frequency, velocity of movements of the

atmosphere, and the points of the compass from which they blow.

3. Electricity—electric changes and tension.
4. Precipitation—the amount of rain, hail, and snow falling upon the earth. Measured by inches and hundredths.
5. The production of ozone.

Since these constituents are dependent upon barometric pressure, the degree of humidity and temperature, it is clear that all meteorological changes are dependent upon the relation, for the time being, to each other of these representatives of *elevation* (with corresponding decrease of barometric pressure): *dryness* and *equability* of temperature.

Interchanges between the moisture, the temperature, and the pressure of the air-column within certain limits is that condition of climate under which the human organism commonly remains undisturbed. What are these normal limits? These can only be defined by saying that they exclude excessive fluctuation of either constituent. Excesses of moisture, fluctuation of temperature, and the effect these have on the weight of the air-column; either one or all may occur suddenly or persistently, as so many degrees of *intensity* and *duration*.

In other words: intensity (acuteness) and persistency (duration) decide the effect of every occurrence—whether pathological, meteorological, or otherwise. Now either the suddenness or duration, or both, of excessive moisture considerable fluctuation of temperature, and the resulting change of atmospheric pressure (resulting frequently in harsh winds) may disturb the normal equilibrium of our atmospheric conditions, and with it the normal equilibrium of the vascular and nervous systems of the human organism.

Fluctuation of temperature? Do we mean a falling or a rising thermometer, sudden cold or heat? Either. Excessive moisture with sudden cold is, as we know, the fruitful

immediate cause of acute inflammation of the air-passages. Excessive moisture with sudden heat is the immediate cause of stagnant hyperæmia, venous congestions—the products of which undergo cheesy degeneration. So that we have on the one hand active *inflammation* induced ; on the other caseation—necrotic tissue and the subsequent *infection*. Let us now condense a few facts :

1. Moisture is the normal ingredient of the atmosphere. Whether the excess be one of great suddenness or persistency we know it hinders evaporation of aqueous vapor from the lungs, and retards insensible perspiration (or respiration) through the skin ; in other words, hindering equable water-abstraction through skin and mucous membrane—outer and inner covering ; hindering the regulation of vascular pressure.

2. Equability of temperature being disturbed by sudden or persistent falling or rising of the thermometer, the result is an inability on the part of certain persons, called “vulnerable,” to adjust their sensations to the suddenly increased cold or heat. The changes to cold occur, of course, most frequently in cold (frigid) regions ; the changes to heat occur most frequently in hot (torrid) regions. In the temperate zone these differences co-exist with northern and southern latitude respectively.

3. Changes in barometric pressure are caused by the change in the quantity of moisture in the air and its temperature. Considering the immense pressure upon the surface of the human body, it is easy to understand how a deviation from the normal cannot be reacted upon by those of irritable circulation.

4. Here, then, we have factors calling upon increased adaptability by reaction of the vascular and nervous systems. The individuals who can least respond to this call are the so-called “vulnerable,” and the chief characteristic

of vulnerability is an excitable condition of the vascular and nervous systems. In the action of blood-vessels controlled by the sympathetic nerves, this excitability is manifested by tendency to *extremes*. In cold climates, the statistics teach us, this extreme is *inflammation* more or less acute. In warm climates, as shown by statistics, the other extreme is reached—namely, stagnation, embolism, caseation, micro-necrosis, and *infection*.

5. Pulmonary consumption appears to our senses as the co-existence and co-operation of inflammation and infection; both either acute or chronic. Chronic inflammation is seen in catarrho-fibroid phthisis (cirrhosis); subacute in the formation of cavities. Chronic infection is seen in localized tubercular invasion; acute in miliary tuberculosis. The co-operation of inflammation and infection is seen in a cavity (excavation) or cirrhosis (condensation) being complicated by chronic septicæmia or acute tuberculosis; and in chronic tuberculosis being complicated by subacute catarrh of the bronchioles.

6. Statistics establish the fact, that the tubercular form of consumption is by far most prevalent in the torrid zone; and that the inflammatory conditions of the air-passages, which may lead to consumption, are by far most prevalent in northern latitudes.

I have spoken of moisture as the "normal" ingredient of the atmosphere. As such, moisture is the only palpable constituent in the atmosphere, temperature and pressure being only impressions. Other ingredients are found in the air in sufficient quantity to attract our attention as pathological factors, and these are abnormal admixtures. They are dust, as inorganic matter; and vegetable and animal micro-organisms, as organic matter. Let it be well understood that comparatively small changes in the moisture of the atmosphere create great differences; while with the

abnormal ingredients small and infrequent quantities are harmless, quantity being a necessary hurtful element.

Dust is most frequent in the absence of warmth and moisture, and present with dryness. Micro-organisms, on the contrary, are most frequent in the presence of warmth and moisture.

Dust and germs in quantities, one as mechanical irritation, producing inflammation; the other a follower of tissue-death, and ushering in putrefaction, which is infection.

As such, then, they may be considered agents which may assist in the aggravation of pulmonary trouble. *The* cause which we know to be the immediate one of consumption is subsoil moisture, a fact fully established by Dr. H. I. Bowditch, of Boston.<sup>1</sup>

It is strange enough that this fact was not established long ago, when we consider that we have on one side, the individuals, on the other the soil and atmosphere, upon normal condition of which the inhabitants are dependent for health. Individuals range from the normally robust, through many shades, to the readily vulnerable, and all are likely to be exposed at some time or other.

Nothing is more natural than that the vulnerable in skin and mucous membrane should be more readily attacked. The lung is not only the sole organ of our body communicating openly with the outer world, but the one to inhale the atmosphere. Now, subsoil moisture is hurtful in that it furnishes a constant supply of surplus moisture to the atmosphere, and, though comparatively harmless when the ground is frozen, is a breeding-ground for germs in warm weather. A certain degree of warmth (37° to 42° C.) and a

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<sup>1</sup> Bowditch: "Topographical Distribution and Local Origin of Consumption in Massachusetts," *Med. Communications, Mass. Med. Soc.*, vol. x, 1862; "Consumption in New England and Elsewhere; or, Soil Moisture One of its Chief Causes," 1868.

certain degree of moisture we know to furnish the culture-ground for microscopic organisms.

Thus our knowledge and reasoning teaches us this: All meteorological causes of pulmonary consumption are found in the excess of the moisture admixture (aided by mechanical or micro-organic admixtures sometimes) and the extremes of temperature—heat and cold; moisture and cold being productive of the inflammatory part of the trouble, moisture and heat of the caseation—necrosis and infection.

Knowing, now, thus much of climatic causes of consumption, the persons whom it attacks, and the double form it assumes, we look for a climatic remedy in the opposite direction from the causes. In other words, we look in climatic treatment of consumption for a low percentage of moisture, fluctuations, and extremes of temperature—namely, *dryness and equability with coolness*.

So far we are all agreed. But when it comes to ascertaining where dryness and coolness are found in company, it is found that equability of temperature must be sacrificed, because dryness and coolness are found at elevated stations, where fluctuation of temperature is the law.

Again, if we wish to find equability, we find it in the dangerous company of moisture, and dryness is necessarily excluded.

Let us now reason in this way: We would like to find a combination of dryness, equability, and elevation. Elevation is found in all zones (torrid, temperate, and frigid). Dryness is found at distances from the ocean. Equability is found upon the ocean.

The worst form of consumption, the tubercular, is the product of the torrid zone, and it is a law that distance from the equator lessens liability to tubercular consumption. Therefore, we are to look for our prescription for distance from the equator and from the ocean.

In our part of the Western hemisphere this distance from the equator and from the ocean (the chief source of moisture) is, of course, far inland. But if we go straight north from the equator, we get into the frigid zone, and there meet with the second of our objections—extreme cold. If, then, the distance between the oceans be not great enough to insure the proper dryness (and it is not) we must look for increased distance in a vertical direction, and this is found at far inland high altitudes. Here we find both dryness and elevation, two of our desires, and have escaped the two enemies—moisture and extremes of temperature. So we may formulate: The avoidance of the causes of consumption, all of which are intimately connected with excessive moisture (of soil and atmosphere) and extreme heat or cold—but more particularly the former,—necessitate horizontal or vertical distance from the sources of these causes, namely, the vertical sun of the equator and the ocean.<sup>1</sup> These requirements of dryness with coolness are found at inland altitudes.

But what is to become of our equability? Well, we cannot have every thing good in one prescription. Still, if our judgment tells us that the sensations and resisting power of an anæmic patient are not to be trusted to a radical change, we must look for a palliative one, and we find it in equability of temperature. But let it be remembered that moisture must be taken with it,—more moisture than the patient has probably been accustomed to. It is the old fight of palliative and expectant treatment as against the radical cure.

<sup>1</sup> To understand what is meant by vertical distance as added to the horizontal one, it should be remembered that moisture arises from the whole surface of the globe—chiefly, however, from the ocean. Moisture arises immediately over the surface of large bodies of water, and spreads over adjacent land not much higher than the sea; the surface of the ocean (sea-level) being the true level surface of our globe. Some moisture arises from land also. Now, if I say that distance is increased by vertical measurement, it is intended to convey the truth that the combined moisture of sea and land hovering in the lower air-strata, have elevation to contend against, which elevation forces moisture to spread upward into space and thereby become diminished. In this sense a foot of vertical elevation is equivalent to the value of a number of miles of horizontal direction.

Palliative treatment at home delights in internal medication, and abroad in equability of temperature. Radical treatment delights in surgical procedure at home and dryness and elevation abroad.

The above is, I think, a clear and distinct statement of the facts in connection with the climato-therapy of consumption.

How does the profession of this country stand upon this question?

To properly understand the drift of various opinions, it should be kept in mind that, in the absence of any formidable array of favorable statistics in favor of certain climatic conditions, cure was, and is now, sought :

1. In the opposite of the causes of consumption.
2. In the climates where immunity among original inhabitants prevails.

The chief climatic conditions are: elevation (reduced barometric pressure); dryness (hygrometric); and equability (fluctuations of thermometer). In connection with these we speak of the temperature of various seasons (hot, warm, cool, or cold).

1. On account of *causes*: In the first half of this century Broussais' teaching of the inflammatory nature of consumption held sway. Cold weather was supposed to be the chief immediate cause of consumption. Hence, as stated on a previous page, temperature alone was made the curative test, and the opposite of cold—namely, warm climates—were chosen.

2. On account of *immunity*: This has been claimed at various times for elevation and certain degrees of temperature; dryness, strangely enough, attracting no attention. Inhabitants of high altitudes were shown to be exempt, until many exceptions were noted, all of which exceptions were at *moist* altitudes. Of temperature, the reverse of the

Broussais theory was seized, because, as was demonstrated, the inhabitants of the frigid regions were exempt. To this finding numerous exceptions were soon noted, and these exceptions again pointed to the prevalence of consumption in cold, *moist* climates.

Of exemption claimed on account of food, prevalence of other diseases (ague, etc.), we have no time to speak here.

Nor can more be said of immunity here, than that dryness, elevation, and equability (but not temperature *per se*) each have their share in insuring immunity; and that this is in accord with the causes of consumption also—of which subsoil moisture is the chief; while dryness is the chief antidote.

The writers of treatises upon the practice of medicine cling largely to making trial of warm and moist, cold and dry, etc., according to the sensations of the patient. So Dr. Loomis teaches that every consumptive has his climate; that his sensations must be consulted as to warm or cold, and the comfort or discomfort arising from moisture; and that a patient should remain where he finds himself improving.

Dr. Austin Flint teaches that warmth and moisture are, on the whole, to be preferred; that sea-voyages are frequently beneficial; that the analyses of several hundred cases does not permit him to establish any rules; and lastly, that all benefit of change of climate is due to the accessory circumstances of out-door life, freedom from care, good food, etc.

This abstract of the opinions of two leading medical men represents the belief of a majority of the medical profession, as regards choice of climate, I am sorry to say.

It was with a view to bring out the opinions of the profession with reference to climatic influences, and also to give renewed impetus to the climato-therapy of consumption,

that I addressed, now nearly a year ago, a circular letter to prominent men known to be interested in the subject.

The opinions of the profession in this country may be broadly divided into three heads:

1. Those who cling to the Broussais theory of selecting places on account of prevailing temperature—warm in summer, cool in winter.

(a). *Equability of temperature* (warm in summer, cool in winter), whose chief defender was the late Dr. F. D. Lente, of Palatka, Florida.

(b). *Equability of temperature*, a certain degree of, but not great, *dryness* insisted upon, with warmth and coolness.—Dr. W. H. Geddings, Aiken, So. Carolina.

2. Those who base their choice upon the supposed immunity in part established for inhabitants of *elevation*; for *dryness* and for *temperature (cold)*.

(a). The claims of elevation are championed by quite a number at the present time, prominent among those who have written upon the subject being Dr. Charles Denison, of Denver, Colo., and Dr. H. V. M. Miller, of Atlanta. The former defends altitude immunity in connection with dryness.

(b). Immunity on account of a pretty *uniformly cold temperature*, with such dryness as far inland position naturally guarantees. This view is represented by the Minnesota physicians, prominent among whom are Drs. Talbot Jones, D. W. Hand, Franklin Staples, and Brewer Mattocks.

My questions had reference to the relative value of dryness, elevation, and equability of temperature. Of course it was not necessary to ask opinions about sunlight, electricity, rain-fall, etc., because they are dependent upon the three prime constituents.

#### I. ELEVATION.

Question 1st.—Do you believe elevation to be a necessary factor for a suitable climate for consumptives?

Question 2d.—If so, is it because you expect to find at altitudes fresh air in abundance only, or because the atmosphere is comparatively free from micro-organisms—an aseptic atmosphere?

Out of the eighty-six answers received<sup>1</sup> fully sixty knew of no evidence to prove the necessity of altitude in any class of cases.

Of the believers, a number drew my attention to the fact that there were various forms of phthisis; an unnecessary kindness, since I only wished to know if they had proof of the value of elevation in any class of cases. The “fresh-air-in-abundance” benefit at altitudes was embraced by the majority; some on the ground that we knew nothing of an aseptic atmosphere anywhere; others, that freedom from disease germs had never been shown to have a curative effect in pulmonary consumption.

“Elevation necessary only so far as it insures purity of atmosphere and absence of subsoil moisture; drainage is more facile.”—Dr. Deering J. Roberts, Nashville, Tenn.

“Enforced exercise, as at Davos, is a very important factor.”—Dr. Thos. F. Rochester, Buffalo, N. Y.

“For reasons of drainage and dryness of soil.”—Dr. H. R. Hopkins, Buffalo.

“Only as it tends to secure the proper dryness.”—Dr. Roswell Park, Chicago.

“Only as it gives dryness.”—Dr. Alex. J. Stone, St. Paul, Minn.

“Because less dampness and less miasm there.”—Dr. L. P. Yandell, Louisville, Ky.

“We are obliged to consider carefully the presence or absence of malaria.”—Dr. Starling Loving, Columbus, Ohio.

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<sup>1</sup> For the detailed answers see *N. Y. Medical Journal*.

What are the established facts with regard to this question?

Have we a micro-germ specific to tubercle (and, inferentially, of consumption)? The bacillus tuberculosis of Koch has an existence in tubercle, lung cavities and infiltrations, and phthisical sputa.

Of its cultivation outside of the body through several generations, and the infection with it on previously healthy animals, we have, thus far, Koch's very carefully conducted experiments; true, upon animals which may be called susceptible or vulnerable.

Have we proof that ordinary bacteria of putrefaction (bacterium termo) are either found in the phthisical lungs or may be successfully introduced?

Yes, we have them in necrotic lung tissue (micrococci, too), but they do not, by inoculation, produce tuberculosis. The difference of appearance between the bacillus tuberculosis and the ordinary consists chiefly in form, and in the bacillus absorbing certain colors, which the common fellows do not do.

Have we proof of the existence of micro-organisms in the atmosphere? We have. It was my intention to cite the evidence in full for every question, but as this would lengthen this article beyond endurable limits, I must content myself by referring to observers. Cohn of Breslau, Naegeli, Wernich, and Brantleht<sup>1</sup> have demonstrated not only the presence of germs in moist soil, but their conveyance into the atmosphere when bubbles are formed; and also floating in dust.

We are told that the various forms of micro-organisms

<sup>1</sup> *Deutsche medicinische Wochenschrift*, No. 50, Dec. 9, 1882, p. 687.

"Floating Matter of the Air in Relation to Putrefaction and Infection," by John Tyndall, F. R. S., 1882.

"Bacteria." By Dr. Ferdinand Cohn. (Translation exists, by Dr. Dolley, of Rochester, 1881.)

"Lectures on the Relation of Micro-organisms to Disease." By Dr. Wm. T. Belfield.—*Medical Record*, Feb. 24, 1883, and subsequent numbers.

(micrococcus, bacterium, bacillus, vibrio, spirillum) float in intermitting clouds, so that there is no uniform distribution throughout the atmosphere.

What evidence exists as to their absence at certain altitudes, either on account of distance from sea-level, or because of dryness, with cool or cold temperature?

Nothing but deduction ; no experimental proof. Professor Tyndall states that germs are incapable of rising above the lower air-strata. Cohn says (p. 28): "But they may be carried by the winds to unmeasurable distances, and also to extraordinary heights." The fact that heat and moisture are promoters of germ-life leads us to infer that dryness and cold are inimical thereto ; but Cohn, among others, tells us that "experiments prove that even a chilling for many hours below eighteen degrees does not kill bacteria." Of course there can be no doubt that the congregation of human beings at altitudes lays the foundation for animal and vegetable putrefaction, and the accumulation of excrementitious matter.

Dr. Bowditch, of Boston, was correct, then, when he wrote to me, that these matters were entirely theoretical. Deduction gives us a probability ; but thus far we lack all scientific experimental proof of the aseptic quality of high-altitude atmosphere.

Question 3d.—Have you reason to believe that reduced pressure of the air-column, such as exists at considerable elevations, has any decided therapeutical effect upon the human organism, independent of the purity of the atmosphere?

This question has been investigated theoretically as well as practically. Practically, very excellent results,—results which, I venture to say, have not been demonstrated by resort to any other climate, have been attained. I refer to the effect of altitude upon expansion of the lungs and

thorax, and upon the force and frequency of the heart's action.<sup>1</sup>

Both diseased and sound lungs have expanded in patients, as well as the lungs of well people, as shown by compensating hypertrophy and local emphysema, and increase in the measurements of the thorax in the antero-posterior and lateral diameters. Force of the heart's action is increased by prolonged residence, and frequency of pulse reduced. How this is accomplished has been in dispute for years. The question was whether more profound or more frequent respirations made up the difference between the quantity of oxygen of the air at sea-level in a given cubic space and the lesser quantity in the same space in rarefied air. This hair-splitting is very readily decided by examining the variety of results attained (some of them by myself), in which profundity of breathing and increased frequency are equally represented, the whole matter being one of *individual accommodation*, and always ending in the person's lungs and heart accommodating themselves to the changed surroundings.

Of those colleagues who attributed any effects to reduced pressure, some gave no reason at all; others argued on one side or the other of the above respiration question, but gave no experience of their own. Dr. Chas Denison, of Denver, Col., alone referred to the experiences of others and to his own, as published in his work on "Rocky Mountain Health Resorts."<sup>2</sup>

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<sup>1</sup> "Treatment of Phthisis by Residence at High Altitudes." By Dr. C. Theodore Williams. Reprint, International Medical Congress, London, 1882. Other observers will be found noted there (p. 17).

"Le Mexique et L'Amerique Tropicale, Climate, Hygiene, et Maladies." By D. Jourdanet.

H. Weber, *Klimatotherapie*.—Allgemeine Therapie (Ziemssen).

Ornolles—De l'influence du climat des Andes sur la Phthise.

H. Weber.—Medico-Chirurgical Transactions, vols. iii and 52.

"Influence of Climate in Pulmonary Consumption." C. Theodore Williams. Lettsomian Lectures for 1876.

<sup>2</sup> See particularly page 128.

Dr. J. G. Westmoreland, Atlanta, Ga., said: "I think it injurious to those of diminished breathing capacity." We note, therefore, that demonstrable changes take place in the lungs and circulation of consumptives at high altitude, results which neither have been nor are attainable elsewhere. This I positively assert on the strength of my familiarity with the literature of climato-therapy of the past and present. We know that *these* results are not produced by constituents associated with inland altitudes—namely, dryness and coolness.

## II. DRYNESS.

Question.—Do you agree with me in considering dryness a most potent factor in the climatic treatment of consumption?

This question was answered in the affirmative by nearly every one; and "dry and warm," "dry and cool," and "dry and cold," each had numerous admirers. There were a few who did not specify any other qualities of climate (elevation or equability) for any form of phthisis than is expressed in one of the above captions, without any reference to the fact that dryness below, or only slightly above, 50 per cent. of saturation, occurs only in connection with far inland medium or high altitudes.

Dr. Baumgarten, of St. Louis, qualified the benefits of dryness as being confined to those who are not irritable; the nervous not doing well in a dry climate.

"Dryness is a most potent factor, because the specific cause of the disease develops best in, and absolutely requires, moisture."—Dr. James T. Whittaker, Cincinnati.

"So far as I know, tubercular consumption is almost unknown in the driest climates."—Dr. Alfred Stillé, Philadelphia.

A large majority accepted dryness on condition that it be

not coupled to elevation, because of their knowledge that equability of temperature was supplanted by instability at high altitudes. Now, I submit that dryness at sea-level or low altitude is never real but only moderate—the monthly mean humidity is throughout above 55 per cent., seldom below 65. A glance at Vivenot's table gives an idea of what "dryness" means :<sup>1</sup>

Dry Climates,	{ Excessively dry,	1-55	%	relative humidity.	
	{ Moderately dry,	56-70	%	"	"
Moist Climates,	{ Moderately moist,	71-85	%	"	"
	{ Excessively moist,	86-100	%	"	"

In our zone the percentages of dryness, below or only slightly above one half saturation (50 per cent.), are found only at far inland medium or high altitudes. Putting their experiences and theoretical deductions together, the result was :

1. A two-thirds majority in favor of *equability first and dryness afterward*, which means sea-coast or low altitudes near the coast in southerly latitudes.

2. A minority in favor of dryness first and equability to this extent, that very moderate altitude only should be chosen, where moderate equability still exists.

What do we know of the effects of dryness? The practical results attained in dry climates cannot be separated from those attained at altitudes, and the value to be ascribed to dryness is only to be gotten at by comparison with the results of altitude without dryness (Rocky Mountains as against Adirondacks).

An exception to this general rule is found in the published results of fifty-five cases sent by Drs. C. J. B. and C. T. Williams to Egypt (dry without altitude),<sup>2</sup> in which the results were favorable. Another exception is in the case of

<sup>1</sup> Ueber die Messung der Luftfeuchtigkeit—Rudolf v Vivenot.—*Schmidt's Jahrbuecher*, Band 132, p. 248.

<sup>2</sup> *Medico-Chirurgical Transactions*, vol. 55.

the tribes of the Kirghis steppes, where dryness is the only noteworthy climatic attribute.

Of the physiological results we know that the greater the amount of *absolute* humidity the greater are the conducting properties, and hence by readily conducting caloric humidity cools organic bodies. But temperature must be here considered. This cooling in the presence of excessive moisture in winter is not desirable, when it is already cold; and the heat of summer induces the production of sweat, which is checked by excessive humidity not permitting the atmosphere to take up any more, and hence a heating effect is produced upon the body. Dryness, by which we mean a low degree of humidity, does not conduct the caloric of the human body. When coupled to cold, vascular activity (where it exists) is called into full play; when coupled to warmth or heat, perspiration through the skin and the evaporation from the lungs is rapidly taken up into the dry air. This represents the equalization of the pressure of the vascular system by internal and external evaporation.

Just how much of a share dryness has in arresting active moist ulceration, casting off necrotic tissue by demarcation and thus setting up a healing process, can only be conjectured and judged by the results *in toto*. In very dry climates the sputa of consumptives should be microscopically examined at fixed periods, in order to ascertain what particles float in the serum.

Of the effects of shrinkage and desiccation, instead of the ushering in of moist putrefaction, we have ample evidence in the shrunken carcasses of animals on arid plains. Instead of destruction or excavation of juicy solids, there is shrinkage; instead of the evolution of gases, there is absence of odor; in the absence of warmth and moisture together and the moist necrosis, there is an absence of the organisms of decomposition, which usher in putrefaction—

bacteria, micrococci, etc. Indirectly this is an argument for an aseptic atmosphere at elevations.

### III.—TEMPERATURE.

We note *degrees* of warmth on the one hand, and *fluctuation*, presence or absence of stability, on the other. The first are the mean temperature degrees of a day, month, or year; the second the range, the number of degrees the thermometer fluctuates in a given time—which tells us of the equability of temperature. Heat, warmth, coolness, or cold, are the representative sensations conveyed to us by climates in various latitudes; southern latitudes in this zone being warm, northern cold.

Equability is governed by the possibility of land or water retaining the heat they have absorbed from the sun's rays in the daytime; which, in night-time, is kept from being radiated skyward by the moisture of the air. Hence equability and moisture are close relations. No climate, therefore, can be judged by, or has any effects on account of, its mean temperature alone, hot or cold simply denoting, broadly speaking, distance from the equator. That this distance may be horizontal or vertical has been explained, and again serves to show why high altitudes are naturally cool. Their lack of equability is due to lack of moisture in the air (dryness) and consequent radiation from the earth's crust at night, and their temperature is in part due to distance. Elevation may exist without dryness (Adirondacks); where then we have coolness and equability, but no dryness.

Temperature degrees, then, are the least important factors we have to deal with; and their range, marking the degree of equability, of greater importance though not in the same measure as dryness and elevation.

As stated in the previous paragraph on "dryness," by far the greater number of my correspondents looked upon

equability as the mainstay of climatic benefits. Equability with warm temperature and equability with coolness, each had about the same number of friends.

Dr. Alonzo B. Palmer says in his recent work on the "Practice of Medicine": "A particularly equable climate must not be insisted upon, except in bronchial and inflammatory cases, as equability presupposes moisture, which is far less favorable to the tuberculous condition." The most ingenious argument in favor of a cold climate with moderate dryness and no equability (Minnesota), was made by Dr. Talbot Jones, of St. Paul. His premises were that immunity from consumption was associated with temperature and with elevation. Of temperature, cold climates enjoyed comparative immunity; of elevation, more or less high altitudes insured equal immunity. This reasoning is not correct, because the premises are bad. In cold climates we find less tubercular consumption than in hot, but the acute inflammations, with all their direct and secondary effects in consumption, have their breeding-ground in cold, fluctuating climates.

Again, I have shown that it is not temperature which insures partial immunity in cold climates, but dryness secured by distance from the source of moisture—the great oceans. So with altitudes. Not elevation alone insures immunity, but dryness secured by increased distance from the ocean on the one hand and from the soil moisture at ordinary level on the other.

The defenders of medium and high altitudes (notably Dr. H. V. M. Miller, of Atlanta, Ga., and Dr. Chas. Denison, of Colorado) held that equability was of no value whatever in the majority of chronic cavities and infiltrations, though allowance was made for its necessity for the "irritable."

Dr. H. von Swearingen, of Fort Wayne, Ind., laid no

stress on equability, but contended that such dryness and plentifulness of air as are found at far inland prairies without elevation answered most requirements.

Dr. S. G. Armor, of Brooklyn, gave it as his experience that the usually asthenic form of consumption required at all times a cold, invigorating climate with or without elevation (Minnesota, Dakota, Montana).

As before stated, the champion of equability, with the avoidance of soil moisture and malaria, on account of the number of clear warm days insuring possibility of remaining in the open air, was Dr. F. D. Lente, of Palatka, Florida.

His neighbor, Dr. W. H. Geddings, of Aiken, is the Jas. Henry Bennett of our country. Equability with the greatest attainable dryness (moderate dryness) with coolness in winter, but without recourse to altitudes, is his gospel.

Both practical results and scientific reasoning are fast pointing to the choice of :

1. The greatest dryness obtainable, mostly found at
2. Medium or high altitudes. We look for these in a southerly latitude, in order to insure
3. Equability in some degree. To insure coolness in summer and winter, latitudes will have to be changed (southerly in winter, northerly in summer).
4. Equability with warmth or coolness to be made first choice only, in cases where decided irritability of any portion of the respiratory tract or a very recent inflammatory exacerbation are the main features of the case.

Sunshine, electricity, winds, precipitation and ozone are not directly concerned in climatic influences ; firstly, because they are dependent upon the three previous constituents ; secondly, because we know too little of the effects of either upon the human organism.

One point in reference to sunshine deserves attention.

The number of clear days is very great in very equable and in very dry climates; there is in both an abundance of sunshine. But the intensity of the sun, both in rarefied and unobstructed (by moisture) climates, is infinitely greater than where sea-level pressure of the air-column and denser moisture intercept the sun's rays.

#### SEA AND MOUNTAIN AIR.

Until within recent years, climates were chiefly spoken of as *marine* and *continental*. Equability is the chief element of marine climates, because, although heat is slowly absorbed by the ocean, it is retained by the moisture blanket hanging over it. Fluctuation, lack of equability, is the chief element of continental climates. Recognizing the percentage of moisture as the most important atmospheric constituent, it were better to speak of marine climates as moist with equability (warm, cool, or cold, as to temperature); and of continental climates as dry, with every range of fluctuation (and a warm, cool, or cold, temperature). It was out of deference to this old division, that I asked a question with reference to the respective merits of sea and mountain air.

Strangely enough, an overwhelming majority declared in favor of mountain air, including a considerable number of those who likewise looked upon equability as the chief desideratum. A few, who shall be nameless, declared in favor of mountain air *because* of its equability; opinions which were suppressed in the publication.

We have seen that Dr. Austin Flint ascribes great value to sea-voyages in some (unspecified) cases. Dr. Wm. T. Plant, of Syracuse, on the contrary, gave it as his extended experience, that no case of phthisis ever did well at sea for any length of time.

Dr. J. N. Danforth, Chicago, said: "Most cases are helped by sea-air, etc,"

Of the disadvantages of sea-air, in connection with the sea-coast, Dr. H. I. Bowditch, of Boston, said : " I have no doubt that the sea-coast of New England and possibly of the Atlantic still farther south, *is always injurious to the consumptive at any period of the disease.*"

Mountain air as such has been discussed. What do we know of sea-air? Only that for absence of soil admixtures (additional moisture, dust, gases, micro-organisms), the chief direct causes of consumption, the broad ocean and inland mountain plateaux are both relatively free. Of salt air, acting as a mild antiseptic, we have no proof. Of the value of sea-voyages in cases of broken-down constitutions with moderate lesions, dependent upon this general condition, we have ample evidence in the writings of all authors.

More convenient than the vague definition of sea and mountain air, for the sake of comparison, are the more comprehensive terms of

#### SEDATIVE AND STIMULATING CLIMATES.

These designations include the three chief constituents of climate and the ruling temperature of the same.

Briefly, we may say that sedative, means : Equability of temperature with very considerable or with only moderate moisture, and in temperature hot, warm, or cool. Stimulating, means : Very great or moderate dryness with low, medium, or high altitude, and in temperature cool or cold, according to latitude.

The question to my correspondents as to their preference for sedative or stimulating climates for the various forms of phthisis was perhaps the best one to bring out as complete an answer as possible ; the more, as I named certain localities in connection with each kind of climate. This brought out a much greater unanimity of opinion than might have been expected.

With few exceptions, mostly previously quoted, the

opinion is unanimous, that where decided irritation of mucous membrane (and skin) and tendency to or recent recovery from active inflammation supervened, a sedative climate was indicated.

This was expressed in various ways, Dr. Glasgow, St. Louis, speaking of "tendency toward inflammations of mucous membranes." Dr. Baumgarten, of the same city, "only for nervous, erotic persons." Others spoke of conditions of irritation and liability to inflammatory exacerbation and hemorrhage as "irritable bronchi," "pneumonia cases," "irritable cavity," or "irritable air-passages." The unanimity was marred by two facts :

1. That a great number preferred for this class of cases a warm instead of a cool temperature, with the equability.

2. That only a minority agreed with me as to the propriety of considering sedative climates only as an expedient ; as a palliative, which was to serve as a stepping-stone to medium and high altitudes, in order that the well-known effects upon the thorax and circulation might be insured, after decided irritation or tendency to inflammation of mucous membranes had been in a measure reduced.

The stimulating, tonic climate as such (dryness as the leading attribute, altitude or none, and a cool temperature) was accepted by a two-thirds majority as the climate for the average chronic case of consumption, of excavations in the shape of cavities, or condensations in the shape of infiltrations, with slow but persistent progress, no recent exacerbations or well-marked irritation—the commonest presentation of pulmonary consumption. Of American authors we have seen that Dr. Loomis<sup>1</sup> and Dr. Flint<sup>2</sup> both rest the decision as to the proper climate upon the sensations of the

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<sup>1</sup> Loomis : " Diseases of the Respiratory Organs," 1882.

<sup>2</sup> Flint : " On Phthisis," 1875.

patient, both as regards dryness and the degree of temperature (warm, cool, or cold). Dr. Loomis sees a climate for every patient: "The experiences of the individual is the only safe guide in the choice of a locality best suited to his or her own case." Dr. Flint: "Whether a cold is to be preferred to a warm climate, in particular cases, must depend upon the predilections of a patient, the past individual experience as regards the relative effect of cold and warm weather on the feelings and the general health, etc."

Dr. Roberts Bartholow,<sup>1</sup> and Dr. A. B. Palmer,<sup>2</sup> both declare for dryness and elevation; with the exception, of course, of the irritable and inflammatory cases.

In regard to the stages of development in which climatic treatment is likely to result in benefit, the above four authors are pretty well agreed that it is confined to the first stage.

This, too, is the opinion of about one half of my correspondents. The other half, on the contrary, see in dryness, medium or high altitude, with coolness, remedies not sufficiently tested on second-stage cases.

The answers to the question of the most suitable localities in this country and abroad, included every region or station of note, either as being equable or dry, with little or considerable altitude. The details will be found in the *N. Y. Medical Journal* (June 9, 16, 23, and 30, 1883).

As to a change of location or latitude, or both, opinions were equally divided into: Those who would have patients remain permanently in the place where they are benefited; those who preferred south in winter and north in summer; and those who were of the opinion that patients should graduate from lower to higher altitudes.

Nothing would be more interesting than the carefully

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<sup>1</sup> Bartholow: "Treatise on the Practice of Medicine," 1880.

<sup>2</sup> Palmer: "Practice of Medicine," 1882.

gathered results of experience from equable, dry, and elevated stations respectively. As this would involve detailed cases, with a history of their progress from time to time, I contented myself this time with asking what each one could say of the general results of climato-therapy. The result was as follows :

1. About thirty reported cases and permanent arrests in encouraging numbers, as the result of their experience. Of these, eighty per cent. were of those who preferred dryness with moderate or high altitude for the average case of slowly progressive excavation (cavity) or shrinkage (infiltration).

2. Temporary arrest and "prolonged life" was reported by sixty-two ; about equally distributed between equable climates and altitudes.

3. One fourth of the whole number had no encouraging results to cite ; some were "discouraged," others "confused," and finally there were those who had "no faith in climato-therapy."

Let us briefly summarize what we positively know of the effects upon pulmonary consumption of the climatic constituents of elevation—dryness and equability,—both from practical experience (published only in part) and from the teachings of climatology.

1. *Elevation.* Practically : Numerous cures recorded, where, however, in some cases, altitude cannot be separated from dryness. Effects on thorax, lungs, and heart noted. A relatively aseptic condition of atmosphere at elevations not experimentally proven ; effects of reduced barometric pressure proven by widening of thorax, etc.

2. *Dryness.* Practical results : In Egypt, where dryness prevails and altitude is excluded ;<sup>1</sup> results at Aiken, S. C., and at altitudes, as mentioned above. Absence of putre-

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<sup>1</sup> *Medico-Chirurgical Transactions*, vol. 55, London.

faction, supplanted by dry shrinkage without organisms of putrefaction and consequent chemical decomposition in dead animals. Effects upon equalizing blood-pressure by evaporation from lungs and skin.

3. *Equability.* Practical results: Allaying of irritation and of recent inflammation. Many proofs of temporary arrests, few of permanent cure. Bettering of general condition and, with it, of troubles dependent thereon. As equability excludes cold, the sensations are soothed; skin and mucous membrane do not shrivel and chill. Possibility of being out-of-doors great, but absence of all stimulating qualities of air; rarity of atmosphere and a cool or cold temperature.

The following tables of the meteorological data of various stations throughout the United States, copied from the Report of the Chief Signal Officer, are intended to show where, and in connection with what other constituents, equability and dryness are to be found. The localities named do not represent the best health stations, as only few of the latter are supplied with signal stations:

#### I.—EQUABILITY.

##### *a.—Cold, Summer and Winter.*

##### *Unalashka, Alaska.*

1878-'79-'80.	Range.	Mean.	1878-'79-'80.	Range.	Mean.
January . . .	16°	34°	July . . .		
February . . .	16	29	August . . .		
March . . .	22	32	September . . .		48°
April . . .	22	33	October . . .		40
May . . .	13		November . . .	27°	33
June . . .			December . . .	26	35

Mean relative humidity, 92 % ; excessively moist.



*b.—Warm, Summer and Winter.**San Diego, California.*

1879-1880	Range.	Mean.	1879-1880	Range.	Mean.
July . . . .	17°	65°	January . .	41°	51°
August . . .	30	68	February . .	28	50
September . .	38	66	March . . .	31	52
October . . .	46	62	April . . . .	38	57
November . .	36	55	May . . . .	38	61
December . .	39	53	June . . . .	21	63

Mean relative humidity, 72.4 % ; moist.

*c.—Hot, Summer and Winter.**Key West, Florida.*

1879-1880.	Range.	Mean.	1879-1880.	Range.	Mean.
July . . . .	19°	84°	January . .	18°	73°
August . . .	19	84	February . .	19	73
September . .	18	82	March . . .	24	76
October . . .	15	79	April . . . .	24	76
November . .	24	74	May . . . .	20	79
December . .	15	74	June . . . .	22	83

Mean relative humidity, 74.4 % ; moist.

*d.—Warm in Summer, Cool in Winter.**Cape Lookout, North Carolina.*

1879-1880.	Range.	Mean.	1879-1880.	Range.	Mean.
July . . . .	22°	78°	January . .	33°	54°
August . . .	24	77	February . .	34	53
September . .	25	72	March . . .	34	55
October . . .	37	69	April . . . .	37	60
November . .	47	55	May . . . .	30	70
December . .	36	56	June . . . .	26	75

Mean relative humidity, 78.5 % ; moist.

## 2.—DRYNESS.

*a.—High Altitudes.**Cool in Summer, Cold in Winter.**Cheyenne, Wyoming Territory.*

Elevation, 6,089 feet.

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . .	41.4 %	69°	January .	38.7 %	30°
August . .	39.5	65	February .	50.7	24
September .	29.3	58	March . .	42.0	27
October . .	33.0	46	April . .	33.3	41
November .	39.7	35	May . . .	28.4	53
December .	47.9	25	June . . .	37.5	62

Annual range (max., 94° min.—24°), 118°; very unequable.

*Warm in Summer, Cool in Winter.**Santa Fe, New Mexico.*

Elevation, 6,970 feet.

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . .	38 %	69°	January .	44 %	30°
August . .	35	68	February .	47	26
September .	27	62	March . .	41	34
October . .	41	49	April . . .	40	45
November .	46	37	May . . .	21	58
December .	49	28	June . . .	20	67

Annual range (max., 95°, min.—13°), 108°; very unequable.

*Pioche, Nevada.*

Elevation, 6,220 feet.

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . .	13 %	75°	January .	55 %	30°
August . .	17	74	February .	55	27
September .	13	69	March . .	45	34
October . .	30	51	April . . .	41	45
November .	40	38	May . . .	16	57
December .	58	30	June . . .	15	68

Annual range, 108° (max., 95°, min.—13°); very unequable.

*b.—Medium Altitudes.**Warm in Summer, Cool in Winter.**Salt Lake City, Utah Territory.*

Elevation, 4,354 feet.

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . .	20 %	78°	January .	45 %	28°
August . .	21	76	February .	49	26
September .	17	68	March . .	42	33
October . .	39	51	April . .	44	47
November .	47	36	May . .	37	55
December .	56	29	June . .	24	67

Annual range, 107° (max., 97°, min.—19°); very unequable.

*Hot in Summer, Cool in Winter.**La Mesilla, New Mexico.*

Elevation, 4,124 feet.

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . .	46 %	79°	January .	44 %	45°
August . .	38	78	February .	45	42
September .	34	74	March . .	33	52
October . .	48	61	April . .	19	61
November .	36	48	May . .	23	71
December .	38	44	June . .	28	79

Annual range, 88° (max., 104°, min.—16°); not equable.

*c.—Low Altitude.**Hot in Summer, Cool in Winter.**Red Bluff, California.*

Elevation, 338 feet.

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . .	31 %	82°	January .	67 %	44°
August . .	31	83	February .	58	46
September .	34	77	March . .	46	50
October . .	48	63	April . .	67	56
November .	63	50	May . .	54	65
December .	73	44	June . .	37	76

Annual range, 84° (max., 110°, min.—26°); not equable.

## 3.—DRYNESS AND EQUABILITY.

*Warm in Summer, Cold in Winter.**Winnemucca, Nevada.*

Elevation, 4,345 feet.

1879-1880.	Relative Humidity.	Range.	1879-1880.	Relative Humidity.	Range.
July . . . .	18 %	34°	January . .	58 %	20°
August . . .	19	36	February . .	64	22
September . .	17	39	March . . . .	55	24
October . . .	43	31	April . . . .	52	24
November . .	60	26	May . . . .	33	28
December . .	70	17	June . . . .	17	35

Mean summer temperature, 63°; mean winter temperature, 33°.

## 4.—EQUABILITY AND MODERATE DRYNESS.

*Warm in Summer, Cool in Winter.**Los Angeles, California.*

1879-1880.	Range.	Relative Humidity.	1879-1880.	Range.	Relative Humidity.
July . . . .	32°	69 %	January . .	46°	70 %
August . . .	44	77	February . .	37	65
September . .	54	74	March . . . .	37	71
October . . .	54	71	April . . . .	43	63
November . .	48	69	May . . . .	55	70
December . .	46	74	June . . . .	33	73

Mean summer temperature, 65°; mean winter temperature, 43°.

## 5.—MODERATE DRYNESS.

*Cool in Summer, Cold in Winter.**Saint Paul, Minnesota.*

1879-1880.	Relative Humidity.	Mean Temperature.	1879-1880.	Relative Humidity.	Mean Temperature.
July . . . .	68 %	73°	January . .	71 %	26°
August . . .	67	70	February . .	65	20
September . .	65	57	March . . . .	63	29
October . . .	61	57	April . . . .	59	45
November . .	66	32	May . . . .	61	63
December . .	66	11	June . . . .	67	68

Annual range, 112° (max., 92°, min.—20°); very unequable.

## 6.—MODERATE DRYNESS AND MODERATE EQUABILITY.

*a.—Medium Altitude.**Warm in Summer, Cool in Winter.**Atlanta, Georgia.*

Elevation, 1,131 feet.

1879-1880.	Relative Humidity.	Range.	1879-1880.	Relative Humidity.	Range.
July . . . .	63 %	32°	January . . .	70 %	41°
August . . .	73	34	February . .	58	43
September . .	64	42	March . . . .	62	43
October . . .	71	47	April . . . .	63	50
November . .	68	52	May . . . . .	64	42
December . .	70	54	June . . . . .	60	34

Mean summer temperature, 70° ; mean winter temperature, 54°.

*b.—Low Altitude.**Hot in Summer, Cool in Winter.**Corsicana, Texas.*

Elevation, 445 feet.

1879-1880.	Relative Humidity.	Range.	1879-1880.	Relative Humidity.	Range.
July . . . . .	56 %	33°	January . . .	67 %	46°
August . . . .	57	39	February . .	62	53
September . .	54	41	March . . . .	69	61
October . . . .	57	52	April . . . .	59	56
November . . .	58	58	May . . . . .	68	43
December . . .	62	66	June . . . . .	67	33

Mean summer temperature, 79° ; mean winter temperature, 58°.

## GUDDEN'S ATROPHY METHOD: AND A SUMMARY OF ITS RESULTS.

(*Second Paper.\**)

By E. C. SEGUIN, M.D.

(*With two wood-cuts.*)

**D**URING the month of October of this year I went to Munich specially to see Professor von Gudden's preparations illustrating the various propositions advanced in this analysis, and he very kindly showed them to me himself with the greatest patience and system. I must also thank Dr. Ganser for his courteous assistance in the laboratory, more especially with respect to details as to various points of *technique*.

Before proceeding to continue the enumeration of Gudden's and Ganser's discoveries, it is necessary to insert corrections and additions relative to two topics treated of in the first paper.

First,<sup>1</sup> as to the *pars olfactoria* of the *commissura anterior*. Professor von Gudden has recently been led to return to his former view (against Ganser), that this commissure does not unite the *bulbi olfactorii*, but the *lobi o*. To understand the experimental results, one must have a clear idea of Gudden's view of the anatomy of the rabbit's olfactory bulb: He considers the true bulb structure to sit like a cap over the projected extremity of the *lobus olfactorius*; in other

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\* *Vide* ARCHIVES for October, p. 126. [This paper should have appeared as editorial matter, but was placed among original papers because the editorial space had been engaged.—ED.]

<sup>1</sup> Unpublished.

words, a portion of cerebral cortex is inclosed within the bulb proper. Consequently it is impossible to remove the bulbus olf. without also injuring or removing a portion of cerebral cortex and white substance.

EXPT.<sup>1</sup>—The lobus olfactorius is simply separated by incision from its connections with the brain. The skull is not opened, and no nervous substance removed. Autopsy shows that the separated bulbus, though smaller, has retained its vitality, and the olfactory nerves are normal. Trans-sections and horizontal sections give the following results :

In the bulbus there is no positive atrophy of its essential elements. In the olfactory lobe of the cerebrum (inferior part of frontal lobe) there is distinct though slight atrophy, in size and number, of ganglion cells in the cortex. In the centre of the bulbus (inclosed cerebral substance) the white substance is much atrophied. The tractus olfactorius shows much atrophy of its white substance, more especially the lateral fibres.

Contrary to Ganser, the pars olfactoria of the C. A. is to a great extent preserved. Some fibres are atrophied (absent), viz.: those which in the normal state extended into the intra-bulbar projection of the olfactory lobe, which was cut off by the incision.

Consequently von Gudden holds that the pars olfactoria of the commissura anterior connects two lobi olfactorii, a view which is just as much opposed to Meynert's hypothesis as the former was.

Second, an addition to the anatomy of the optic apparatus. Last year<sup>2</sup> von Gudden presented to the Science Congress at Eisenach a *résumé* of more recent experiments upon the various constituents of the optic apparatus. He repeated his demonstrations that the commissura inferior cerebri and the hemispheric fasciculus of the tractus opticus (*vide* ARCHIVES OF MEDICINE, October, p. 139) are not directly connected, physiologically, with the visual apparatus.

<sup>1</sup>To save repetition it is to be understood, unless specially otherwise stated, that the experiments cited in this paper are made upon newly-born rabbits, which are allowed to live many months before autopsy.

<sup>2</sup>Ueber die verschiedenen Nervenfasersysteme in der Retina und im Nervus opticus.—*Tageblatt der 55. Versammlung der Deutschen Naturforscher und Aerzte*, Eisenach, 1882.

He laid the results of new experiments before the Association with reference to :

1. The relations of the hemispheres to vision. If one hemisphere, even inclusive of its corpus striatum, be removed from a newly-born rabbit, it is impossible, after the animal has become adult, to detect any impairment of sight ; and both the pupils react normally. Gudden does not generalize from this fact ; he simply advances it as true in rabbits. He calls attention to a possible explanation of the conflict between this result and Munk's conclusions, by the fact that Munk always operated on adult animals (or, at least, not on the newly-born) whose cerebrum has acquired certain functional attributes absent at an early period of life.

2. Centre of pupillary movements. He condemns as erroneous his former statement, that after removal of one lobus opticus the opposite was abnormal.

(a) If one successfully removes the superficial layers of one lobus opticus with a sharp spoon, it is observed that the animal is absolutely blind in the eye opposite the lesion, but the pupils are both normal in appearance and movements. Post-mortem examination shows that the optic nerve opposite the lesion is reduced in size, but is white and contains normal fibres. The retina shows a general diffuse reduction in the number of its nerve fibres. The tractus ped. transversus on the operated side is normal. On careful examination one sees a little latero-frontad of the injured lobus opticus a small eminence, more prominent than on the opposite normal side. The eminence is rendered more distinct by partial atrophy of fibres of the tractus opticus.

(b) If, in a newly-born rabbit, we remove one lobus opticus, together with the above-described eminence, the adult animal shows blindness of the opposite eye with wide dilatation of its pupil—a dilatation which is only slightly af-

fectured by the strongest daylight. The optic nerve and retina are as described *supra*, but the tractus peduncularis trans. on the operated side is completely atrophied.

Thus two "centres" are demonstrated: one in the lobus opticus, for vision; the other a little frontad of it, for reflex pupillary movements.

3. The corpus geniculatum laterale is a third "centre," probably a trophic centre for the optic tract and nerve, since after its removal these parts undergo atrophy just as after enucleation of one eyeball [except that the direct (lateral) optic fasciculus remains normal in the former case]. The various experiments bearing upon this question are not yet complete.

4. If portions of one lobus opticus be removed, there are found various segments of localized retinal atrophy (in contradistinction to the diffuse atrophy noticed after removal of the whole lobus opticus). Experiments upon this further differentiation of nerve fibres are in progress.

5.<sup>1</sup> Within a year Gudden and Ganser have been successful in dividing the optic chiasm longitudinally by passing a long narrow-bladed knife through the unopened skull and brain at the vertex.

Results: Complete atrophy of crossed fasciculi of optic chiasm, with preservation of the lateral fasciculi-commissura inferior atrophied bilaterally.

I pass on now to studies in other regions of the nervous centres, continuing the enumeration begun in the former paper.

#### *V.—Demonstration of the pyramidal tract.\**

In 1871, soon after the publication of Hitzig's first experiments on the cerebral cortex, von Gudden removed the

<sup>1</sup> Unpublished.

\* Ueber Dementia Paralytica.—*Correspondenzblatt f. Schweizer Aerzte*, Bd. ii, p. 79, 1872.

frontal portion of one hemisphere (including the "motor centres") in newly-born rabbits. Preparations from the adult brain showed atrophy of the corresponding crus cerebri and anterior pyramid. The date of this experiment is noteworthy; it was certainly anterior to Flechsig's publications,<sup>1</sup> and is the first demonstration of the continuity of the motor or pyramidal tract from the cerebral cortex caudad. The experiment has since been repeated on the dog with even more striking results. Specimens from the dog I was able to examine. They showed, caudad of the atrophied cerebral area, a complete absence of the medial division of the crus cerebri, of the pyramidal fasciculi in the pons, and of the pyramid strictly speaking. Below the decussation the atrophy can be traced in the postero-lateral column of the opposite side. The anterior columns are unchanged. The lemniscus (*schleife*) is also much atrophied on the operated side (compare statements in paragraph on fasciculus ad tegmentum, *infra*).

#### VI.—Connections of the cerebellum.<sup>2</sup>

EXPT.—In a newly-born rabbit one half of the cerebellum was removed. At the autopsy of the adult animal it was found that a very small part of the lateral portion of the hemisphere remained attached to the medulla.<sup>3</sup> A full series of trans-sections was made and studied. Results :

1. In the upper cervical region complete atrophy (absence) of the fasciculus ad cerebellum<sup>4</sup> (*Kleinhirnseitenstrangbahn* of Flechsig) on the same side as the lesion.
2. In the caudal part of the medulla, we find likewise on the same side as the injury : (a) atrophy of a group of cells lying ventral in the medulla ("nucleus of anterior columns"), and of

<sup>1</sup> Yet Flechsig, in his most recent publication ("Plan des Menschlichen Gehirns," p. vii, note; Leipzig, 1883), still claims the demonstration as his.

<sup>2</sup> Ueber die Verbindungsbahnen des kleinen Gehirns.—*Tageblatt der 55 Versammlung der Deutschen Naturforscher und Aerzte*, im Eisenach, 1882.

<sup>3</sup> It was also found that one post-optic lobe was much injured, and that the corresponding crus cerebri had been touched by the spoon.

<sup>4</sup> I would propose this term, fasciculus ad cerebellum, for the ascending cerebellar fasciculus. It is in harmony with the names of adjacent centripetal bundles, viz., the fasciculus cuneatus and the fasc. gracilis.

(b) a second cell-group lateral in the medulla but ventrad of the trigeminal root, the so-called "nucleus lateralis," from its supposed connections with the lateral columns. In this region the fibræ arciformes which go to form the beginning of the corpus restiforme are absent.

d. Sections further frontad in the medulla show atrophy of another nucleus on the same side as the injury, one situated dorsad of ascending root of N. v. At level of N. vii there is complete absence of the corpus restiforme.

4. In the various sections of the medulla it is seen that the olive of the side *opposite* the lesion is almost wholly atrophied; a small part of it is still seen in the caudal sections, and probably its survival is due to the bit of cerebellum which was left in the operation.

5. Sections in the region of N. viii, and further frontad, show a normal state of this nerve, of the upper olives, trapezium, and of the (falsely) so-called "external auditory nucleus," or Deiters' nucleus. The inner division of the processus ad medullam is about normal; while, as already stated, its outer portion, or corpus restiforme, is totally (?) atrophied.

6. Sections through the upper part of the pons Varolii show absence of processus ad pontem, without atrophy of trapezium or of upper olives. It is exceedingly difficult to determine the connections of the atrophied fibres, but many of them were certainly in the opposite half of the pons, a few in the corresponding half, and others were true commissural fibres.

7. Sections further frontad show absence of the processus ad cerebrum on the operated side. The cells of the descending root of N. v are absent. Further on the nucleus tegmenti of the opposite side is almost entirely atrophied. The few cells remaining are to be considered as evidence that another fasciculus probably arises from the nucleus tegmenti and proceeds frontad. That this survival of a few cells is not due to incomplete decussation of the processus ad cerebrum is shown by the absolutely normal state of the other nucleus: were there a semi-decussation, both nuclei would exhibit atrophy. The preserved cells of the nucleus tegmenti are large, and are situated laterad of roots of N. iii. Further frontad the number of cells in both nuclei tegmenti become equal.

Consequently it may be stated that:—

1. The processus ad medullam (or corpus restiforme) has

four origins, viz.: in three cell-groups or nuclei on the same side in the medulla oblongata, a dorsal, a lateral, and a ventral nucleus<sup>1</sup>; it is also derived from the olive of the opposite side.

2. The processus ad pontem arises chiefly from cells in the opposite half of the pons. It does not give fibres to the pyramidal tract. Prof. Gudden does not consider his researches on this point concluded.

3. The processus ad cerebrum proceeds frontad, as is well known, and wholly decussates with its fellow, and has its cell-connections in the caudo-medial part of the opposite nucleus tegmenti.

#### VII.—Connections of the processus ad cerebrum.

In 1881, my friend, Prof. A. Forel, of Zürich, presented to the German Science Congress at Salzburg the results of a most interesting experiment upon this organ.<sup>2</sup>

EXPT.—In a newly-born rabbit the right processus ad cerebrum, the right side of velum medullare anterius, post-optic lobe, and (involuntarily) a small bit of the right processus ad pontem were removed.

Results: Atrophy of remaining (caudad and frontad of wound) fibres of processus ad cerebrum. The atrophy is easily traced frontad across the median line to the left nucleus tegmenti, which is largely atrophied, more especially in its caudal part. Sections frontad of nuclei tegmenti show no lesions. The ventral decussation of the tegmentum (*ventrale Haubenkreuzung*) is slightly unequal on the two sides.

But it is in the sections caudad of the injury that the most interesting fact is found.

The right half of the vermis superior is extremely atrophic; some fasciculi going to the nucleus dentatus are visibly atrophied. The nuclei (dentatus, dactiformis, embolus), as well as the corpus restiforme, are perfectly normal.

<sup>1</sup> This last was known to Deiters as an origin for fibres for the corpus restiforme, and Prof. Gudden has called it Deiters' nucleus; but as this term has been more generally applied to the remarkable group of large cells which are in seeming relation to the acoustic nerve, he will abandon the name.

<sup>2</sup> Sitzungsberichte der 54 Versammlung Deutschen Naturforscher und Aerzte, im Salzburg, 1881. In *Wiener med. Zeitung*, No. 46, 1881.

Other lesions noted are : In consequence of the removal of the post-optic lobe, there is a reduction in the volume of the right lateral lemniscus (*Schleifenschicht*) as far caudad as N. vii. Further caudad no lesions. There is slight atrophy of the so-called crus of the post-optic lobe as far frontad as the corpus geniculatum mediale, which seems normal. The only change in the lobi optici is a very slight reduction of the deep white layer on the right side. The r. descending root of N. v is almost entirely absent, a few cells remaining at the level of the exit of the nerve. N. viii is normal, as is also the fountain-like decussation (*Fontaineartige Kreuzung* of Forel) in the tegmentum, which Meynert and Wernicke would associate with N. v.

The important conclusion drawn from this experiment is that the processus ad cerebrum arises in the vermis superior of one side, and terminates (wholly?) in the nucleus tegmenti of the opposite side.

#### VIII.—*Central connections of the sciatic nerve.*

This subject has been studied by means of Gudden's method by his pupil and assistant, Mayser.<sup>1</sup> He gives a detailed account of the histology and architecture of the rabbit's spinal cords. Then he takes up the study of some cords from which the sciatic nerve had been separated immediately after birth, two by extraction of roots, and one by section of the nerve.

The lesions found in the spinal cord are similar in nature and general distribution, but more extensive and distinct in the cases of extraction.

Results : *White substance.* The only marked change is in the posterior columns of the lumbar enlargement, which are reduced in size on the same side as the injury. The fasciculus cuneatus is alone atrophied, and this lesion gradually diminishes in the dorsal region. In my examination of the specimens I observed in the lumbar region com-

<sup>1</sup> P. Mayser : Experimentaller Beitrag zur Kenntniss des Baess des Kaninchen-Rückenmarks. Inaugural Dissertation.—*Westphal's Archiv für Psychiatrie*, Bd. vii, Heft iii, 1877.

plete absence of the posterior root zone on the injured side. The posterior part of the lateral column is also very slightly reduced in size.

The *gray substance* shows the greatest atrophy. At level of greatest lesion, the anterior gray horn is much reduced in size, and has lost its quadrangular shape, and is barren of ganglion cells. Higher up the postero-lateral group of cells is preserved, especially in the cord of the animal whose sciatic had been simply divided. Some ganglion cells on the side opposite the injury, those sending cylinder-axis processes toward the commissura anterior, must have perished, for they are fewer in number than the same cells on the injured side (evidence of crossed origin of some fibres of sciatic). The posterior horn on the injured side is about one third smaller than normal; still it contains many small ganglion cells, and the difference is mainly in the fibre-system. The substantia gelatinosa is much atrophied, but shows only a small reduction in the number of its cells. The two commissures are reduced in size, the posterior more so.

Essentially similar lesions were found in the cervical spinal cord of a rabbit whose brachial plexus had been extracted.

#### IX.—*Nuclei of the cranial nerves.*<sup>1</sup>

From personal examination of specimens.

NN. iii and iv. EXPT.—Extirpation of the eyeball in a newly-born rabbit, with careful extraction of orbital nerves.

Result: Atrophy in various parts of optic apparatus, as described *supra*; complete atrophy of NN. iii, iv, and vi. Series of trans-sections enable us to study the deeper atrophy of the nuclei of these nerves.

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<sup>1</sup> Prof. v. Gudden has made no systematic publication of these valuable results. Here and there in his papers he refers to the facts which have long been known to him; many prior to 1872, as shown by their citation in Kondracki's Zürich thesis.

1. N. iii.<sup>1</sup> Nucleus in well-known location, caudad of lobus opticus and dorsad of fasciculus longitudinalis posterior. By Gudden's method the nucleus is made out to be triple.

(a) A fronto-ventral nucleus lying upon the fasc. long. post., and giving origin to fibres which pass ventrally in a straight direction.

(b) A caudo-ventral nucleus, partly dorsad of (a), overlapping it somewhat, but also extending (in its caudal part) down to the fasc. long. post. This cell-group also gives rise to direct vertical fibres.

(c) A caudal nucleus lying dorsad of (b), not reaching the level of the fasc. long. post., and separated from the nucleus of N. iv by a distinct barren interval. This contains and gives origin to decussated and horizontally coursing fibres.

In a normal preparation, a horizontal section made just dorsad of the fasc. long. post. shows cells of nuclei (a) and (b) and cross-cut nerve fibres. One made further dorsad, passing through nucleus (c), shows cells and mostly horizontally running nerve fibres.

Similar sections from an animal experimented upon as described above shows : the ventral section's absence of fibres and cells on the same side as the injury ; the dorsal section, on the contrary, exhibits atrophy (absence) of cells and horizontal fibres on side opposite the injury.

The decussation of the fibres of N. iii occurs mostly by the lateral fibres of the root, which pierce the ventral nuclei, then turn pretty sharply mediad and decussate with their homologues to connect with cells in the dorsal nucleus of the opposite side. A few fibres decussate to reach this nucleus through the raphe. The large majority of the root-fibres of N. iii, constituting the medial roots, arise from (a) and (b) and pass out directly.

<sup>1</sup> Vide a short communication in Mittheilungen der Morphol.-Physiol. Gesellschaft zu München, in *Münchener Aerztlichen Intelligenzblatt*, 1883.

Prof. von Gudden anticipates that by a better method of extirpation of single ocular muscles with their attached nerve filaments, we may yet be able to define a greater differentiation of cell-groups in the oculomotor nuclei. In this connection it is well to mention that in studying the atrophied N. iii nuclei, the displacement produced by atrophy of the two ventral nuclei on the side of the injury must be borne in mind. In consequence of the virtual void thus caused, the dorsal nucleus is displaced downward or ventrally, and the fasc. long. post. in a dorso-mediad direction. Prof. Gudden has long ago appreciated and called attention to this source of error in studying sections from regions atrophied by his method. We will see other illustrations of this further on (*vide* corpus mammilare and von Monakow's researches on the thalamus).

2. N. iv. Its nucleus lies caudad of the caudal nucleus of N. iii, and extends down to the fasc. long. post. In pathological brains, sagittal, horizontal, and trans-sections show that the atrophy involves only one nucleus, always the one on the side opposite the injury. Consequently N. iv has a simple origin, and its root-fibres wholly decussate.

3. N. v.<sup>1</sup> Two series of preparations were shown me:  
1. Trans-sections from the nerve centres of a rabbit whose trigeminus on one side had been cut between the pons Varolii and the ganglion Gasserii; the operation was done by the old intracranial method, and was not entirely successful. In the sections, a partial atrophy of the ascending root can be traced frontad from a point between the second and third cervical nerve to the level of exit of root. The descending root and its peculiar cells also show marked atrophy. The motor nucleus and root are, on the contrary, well preserved.  
2. Series of trans-sections from the nervous centres of a calf presenting extensive malformations and atrophies of the brain.

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<sup>1</sup> Unpublished.

The principal lesions presented by this brain, as exhibited in a drawing of its basis, were: (1) absence of right olfactory nerves and tractus (bulb partly preserved); (2) complete absence of both optic nerves and tractus, with preservation of the commissura inferior; (3) partial atrophy of right N. iii; (4) preservation of both NN. iv; (5) root of right N. v seems totally atrophied, while its ganglion and peripheral branches are preserved; (6) absence of both NN. vi; (7) preservation of both NN. vii and of the other nerves caudad

Sections from the level of second cervical nerve to that of lobus opticus examined: On the right side there is complete absence of the ascending (spinal) root of N. v throughout its entire extent. The motor nucleus and root are likewise completely absent. Of the descending root a few cells exist, and a few fibres from them can be traced caudo-ventrad toward the exit region of nerve-trunk.

From these specimens (and others) Gudden is willing to recognize only three roots of the trigeminus, two sensory and one motor. The other roots, as given by Meynert and others, he regards as imaginary.<sup>1</sup>

4. N. vi. EXPT.—Described in paragraph on N. iii. Trans-

<sup>1</sup> In this connection it may be interesting to refer to von Gudden's numerous and ingenious experiments on the question of the trophic function of the trigeminus. Some of these are already quite old and are cited by Kondracki in his thesis in 1872 (E. Kondracki: Ueber die Durchschneidung des Nervus trigeminus, Zürich), but although better than Snelling's they are unknown. He admitted the fact that after section of the trigeminus ulceration of the cornea and other changes of nutrition occurred in the eye. He took newly-born rabbits and caused adhesion of the lids by operation (artificial ankyloblepharon). When this was entirely healed he cut the trigeminus by the intracranial method. Opening the lids ten or fifteen days later he invariably obtained normal corneæ. Consequently he held the eye-lesions following section of N. v to be traumatic in origin. More recently (oral communication) von Gudden has operated by cutting the optic nerve behind the eyeball with the least possible injury to other parts within the orbit. In this operation the ciliary nerves are cut, and besides blindness there is anæsthesia of the cornea. But the lids retain their sensibility and by reflex action continue to protect the eye from injury and dirt; the cornea remains clear. Kondracki also refers to operations on peripheral nerve-trunks after which, by care and cleanliness, the skin of the foot remained free from the falsely so-called trophic changes. Gudden was not aware that long before Brown-Séquard had demonstrated facts like the last, showing ulcerations after nerve-sections to be traumatic.

sections show complete absence of trunk of nerve in the medulla, and total atrophy of the cell-group laterad of genu of facial nerve.

In the calf's brain above described, while the facial nerves and nuclei are well preserved, there is no trace of the fibres and nucleus of NN. vi. In neither case do any cells remain.

Consequently the origin of the abducens nerve is simple and direct.

5. N. vii. EXPT.—In the newly-born rabbit the facial nerve is extracted from the Fallopian canal. If the operation is well done a long piece of the nerve is brought away.

Results: Complete absence of extra- and intra-bulbar root of nerve on operated side; the ventral aspect of the medulla is a little flattened. Sections show absence of root-fibres; the site of genu is vacant, and no cells can be found in the so-called "lower nucleus," the three-grouped nucleus (rabbit) in the ventral aspect of the medulla. On the other hand, the nucleus under the genu of the nerve, near the floor of the fourth ventricle, is absolutely normal; comparison with a normal nucleus shows that no cells are absent.

Consequently the facial nerve has only one nucleus—in opposition to the teaching of nearly all anatomists who have seen fibres of this nerve arise from the nucleus under its genu. Even so recent an authority as Spitzka<sup>1</sup> elaborately describes this double origin of N. vii.

In estimating the full value of this experiment, the result of operation upon N. vi must also be borne in mind: the two experiments mutually support one another, and their agreement (in a large number of experiments by Gudden and several of his pupils) renders an error extremely unlikely.

6. N. viii. As yet it has been impossible to complete an experiment upon this nerve, because of the severe rotatory movements and death by exhaustion which follow its section or extraction. Still, some important negative conclusions have been reached indirectly. First, it has no

<sup>1</sup> Contributions to Encephalic Anatomy, pp. 85-87, *Journal of Nervous and Mental Disease*, April, 1880.

connection with the so-called external auditory or Deiters' nucleus, for a proof of which statement see Monakow's experiment on corpus restiforme, p. 258; second, in Gudden's removal of one cerebellar hemisphere, the nerve and its nucleus were perfectly normal.

7. N. x.<sup>1</sup> EXPT.—Extraction of central end of nerve and its ganglia in rabbits.

Results: Atrophy of well-known sub-ependymal nucleus, dorso-laterad of nucleus of hypoglossus. There is also complete atrophy of a group of large cells lying ventrad of intra-bulbar root of the nerve, and mediad of the so-called nucleus lateralis (which, as shown *supra*, is one of the origins of the corpus restiforme.) The tri-neural fasciculus (Spitzka's good name for the "*gemeinschaftliche aufsteigende Wurzel des seitlichen gemischten Systems*" of Meynert) is also decidedly atrophied on the operated side.

8. N. xi. A number of apparently successful extraction experiments have been made on this nerve, but the brains have not yet been cut.

9. N. xii.<sup>2</sup> EXPT.—Extraction (extra-spinal) of the hypoglossal in a rabbit from five to eight days old.

Results: Complete atrophy of the cells of the sub-ependymal medial nucleus of hypoglossus, and absence of intra-bulbar rootlets. In the series of sections which I examined, there remained a few fibres and cells of the most caudal part of the nucleus, from a slight incompleteness in the operation. The ganglion cells dorsad of the atrophied nucleus, those of the opposite hypoglossal nucleus, and the olives, were perfectly normal.

Hence the origin of this nerve is simple and direct.

These results are very instructive. They show, in an apparently convincing manner, that nearly all the cranial nerves have a much simpler origin than most anatomists—especially those who allow physiological considerations to warp their observation—describe. Yet the one nerve which nearly all observers describe as having a simple direct origin—N. iii—is conclusively proved by most beautiful experiments to have a highly complex nucleus,

<sup>1</sup> Unpublished.

<sup>2</sup> *Idem*, but referred to briefly in several papers.

and to arise by both direct and crossed fibres. Even if we are not prepared to admit that these experiments of von Gudden absolutely settle the question of the origin of the cranial nerves, yet the results are sufficiently clear and constant, it seems to me, to merit the attention of anatomists, and to serve in some measure as a control upon the mere study of sections from normal nerve centres.

*X.—Fasciculus longitudinalis posterior.*

There are no experiments directly bearing upon this part, but from a consideration of some of the specimens above referred to and some others, important negative conclusions can be reached.

It is generally taught by anatomists that this fasciculus is directly connected with the nuclei of the motor cranial nerves, more especially those of NN. iii and iv, serving perhaps as a means of associating or coördinating their action. That this is not so, that it is an example of hypothetical anatomy, is shown by the following facts.

1. In sections exhibiting atrophy of NN. iii and iv, the fasc. long. post. are of equal and normal size, even when one is displaced somewhat, as in atrophy of the oculomotorius.
2. In the mole, whose entire optic apparatus, including NN. iii and iv, is undeveloped and as good as absent, there is a well-developed fasc. long. post.

*XI.—Ganglion interpedunculare.<sup>1</sup>*

This ganglion is a distinct external protuberance in rabbits, cats,<sup>2</sup> and dogs; in the monkey (*Hapale*), and in man it lies concealed in the wall of the foramen cœcum, but is

<sup>1</sup> Gudden: Mittheilungen über das Ganglion Interpedunculare.—*Westphal's Archiv*, Bd. xi, Hft. 2, 1880.

<sup>2</sup> This part is not named, figured, or indexed by Wilder, *op. cit.* "The ventral origin of the fasciculus Meynerti was jointly discovered by Gudden and Forel prior to 1872, but not by Gudden's method."

not to be confounded with the substantia perforata posterior. It consists mainly of small round or spindle-shaped ganglion cells, the smallest of which are very similar to "nuclei" of the neuroglia. It also contains some angular ganglion cells. The little nests described by Forel (Haubenregion, *Westphal's Archiv*, Bd. vii, p. 393) are really made up of most delicate amyelinic nerve fibres.

In horizontal sections of normal rabbit's brain, the G. I. lies caudad of the foramen cœcum, between the lemnisci (Schleife). From its frontal extremity issue the two fasciculi Meynerti, and laterad of these are cross-sections of bundles of N. iii, and longitudinal sections of the pedunculus corporis mammillaris (*vide infra*). A little frontad and quite laterad of the foramen cœcum are cross-sections of the tractus peduncularis transversus.

EXPT.—Removal of one ganglion habenulæ in a rabbit a few days old.

Results: Complete atrophy of corresponding fasciculus Meynerti, of its point of entrance into ganglion interpedunculare, and of the ganglion itself on both sides of the median line. No atrophy of cells observed. It is not stated whether fibres of origin of fasc. M. decussate or not in the ganglion, but from the illustration accompanying the article, it would seem that they did.

## XII.—*The corpus mammillare.*<sup>1</sup>

Von Gudden describes the external appearance and general configuration of the C. M. in rabbits, cats, dogs, monkey (Hapale), and in man. Each animal presents some difference in external configuration of C. M. The rabbit presents lateral accessory eminences, which are the lateral ganglia.

Microscopic examinations (trans-sections), however, show that in all animals there are two sets of nuclei, a medial and a lateral on either side.

<sup>1</sup> Gudden: Beitrag zur Kenntniss des Corpus Mammillare und der sogenannten Schenkel des Fornix.—*Westphal's Archiv*, Bd. xi, Hft. 2, 1880.

1. The lateral ganglion of C. M. It contains large ganglion walls. From its lateral part arises a fasciculus, the pedunculus corporis mammillaris. In the rabbit this fasciculus lies mediad of crus cerebri; most N. iii fibres pass out through it. The ganglion interpedunculare and the beginning of fasciculus Meynerti lie mediad of the ped. corp. mam. It tends dorso-latero caudad to enter the pons Varolii. The columnæ fornicis lie mediad of it. It almost joins the lemniscus (Schleife), but can be distinguished from it by:

(a) Its larger-sized nerve fibres, which can be traced ventro-laterad of the lemniscus, through the trapezium, into the medulla oblongata, as far caudad as the olives.

(b) By any experiment which causes atrophy of the pyramidal tract (*vide* p. 238), such as removal of the frontal part of the brain, or of one hemisphere. On examining trans-sections from such a case, one can trace, caudad of the commissura anterior, atrophy of the fine fibre system of the lemniscus, as well as of the pyramidal tract proper on the side of the injury. The large fibres of the ped. corp. mam. ventro-laterad of the absent lemniscus, between it and the site of the pyramidal tract, are, however, preserved. In passing through the trapezium (never ventrad of it), it becomes more medial and approaches its fellow: in the trapezium the fibres are somewhat scattered, but caudad of it they once more unite to form a compact bundle lying dorsad of the pyramid (which is mostly made up of fine fibres). In the region of the olives the fasciculus tends more dorsad and is lost.

Conclusion: the lateral ganglion of C. M. is unconnected with the hemisphere.

2. Medial ganglion, made up of smaller cells. Two fasciculi arise from it, viz., the fasciculus Vicq D' Azyr (Meynert's radix ascendens of columna fornicis) and the fasciculus ad tegmentum (*Haubenbündel*).

(a) Fasciculus ad tegmentum. *Vide* special paragraph, p. 257.

(b) Fasciculus Vicq D' Azyr.

EXPT.—After removal of one hemisphere (rabbit) this fasciculus and the medial ganglion of C. M. undergo partial atrophy. Refers to illustrations by Cruveilhier, Van der Kolk, and other, of unsymmetrical (atrophied) human brains showing atrophy of one of the two eminences of the C. M.

EXPT.—Removal of one hemisphere and of the frontal part of the thalamus.

Results: Complete atrophy of fasc. Vicq D' Azyr and of the ventral part of medial nucleus of C. M.

Conclusion: The fasc. Vicq D' Azyr arises from the ventral part of the medial ganglion of C. M., and, extending dorso-frontad (in rabbit), is distributed to the nucleus anterior of the thalamus (tuberculum anterius). There it also enters into indirect connection with fibres of the corona radiata, which extend to the cortex cerebri (to vicinity of motor area, according to Von Monakow's experiments—*vide infra*).

### XIII.—Connections of the columnæ fornicis.<sup>1</sup>

EXPT.—Removal of one hemisphere and section or removal of both Ammon's horns.

Results: Trans-sections show complete atrophy (absence) of both columnæ fornicis; the fasciculus Vicq D' Azyr is reduced in size on the side of absent hemisphere.

EXPT.—Removal of one hemisphere without injury to cornu Ammonis.

Results: Columnæ fornicis normal; fasciculus Vicq D' Azyr somewhat reduced in size on operated side.

EXPT.—Incision of one hemisphere and section or laceration of fimbria on one side dorsad of commissura anterior.

Results: Disappearance of columnæ fornicis on operated side; very slight reduction in size of fasc. Vicq D' Azyr.

DR. GANSER'S EXPT.—After removal of one eyeball, a fine

<sup>1</sup> Beitrag zur Kenntniss des Corpus Mammillare und der sogenannten Schenkel des Fornix.—*Westphal's Archiv*, Bd. xi, Hft. 2, 1880.

forceps was introduced through the foramen opticum in the direction of the chiasm, with the intention of destroying the tractus opticus on one side. Besides this, however, a slight cut was made in the tuber cinereum which severed one columna fornicis.

Results : Complete atrophy of injured columna fornicis frontad of corpus mammillare ; caudad the atrophy could be traced behind the C. M. to the point where the col. fornicis decussates with its homologue (*vide* next section) to the side opposite the injury, in the central gray matter. The fasc. Vicq D' Azyr were normal.

These experiments show that the columnæ fornicis enter into the formation of (are continuous with) the fimbria, fornix, and cornu Ammonis.

They also prove in the most positive manner that there is no continuity between the columnæ fornicis and the fasciculi Vicq D' Azyr, and that these fasciculi do not form a genu or loop in or around the corpus mammillare, as claimed by Meynert.<sup>1</sup>

#### XIV.—*Composition of the columnæ fornicis.*

This is much more complex than is taught in works on nervous anatomy, and an approach to an exact solution has only been reached by von Gudden within the last year, after a study of many years, embracing the performance of numerous experiments.

To Ganser, his very able and ingenious collaborator, we owe the first and principal step in this series of discoveries, viz.: the experimental determination of the passage of the columna fornicis *through* the corpus mammillare (contrary to all previous writers, who taught that it arose from the C. M.), and of its origin further caudad and dorsad, in the central gray surrounding the third ventricle.

In 1880<sup>2</sup> von Gudden published an article upon the corpus mammillare and columnæ fornicis, in which he claimed the demonstration of two additional fasciculi of the columna

<sup>1</sup> Stricker : "Manual of Histology," Am. ed., pp. 691-2, fig. 269. New York, 1872.

<sup>2</sup> *Op. cit.*

fornicis, besides the well-known bundle studied by Ganser. In the past year he has found still a fourth bundle in this system, but has not made the discovery public. Consequently, instead of giving an abstract of the paper of 1880, I shall give a *résumé* of what Prof. Gudden demonstrated to me, and of his explanations.

He now considers the so-called columna fornicis (*Fornixsäule*) consist of four fasciculi, viz.:

1. A ventral crossed fasciculus.
2. A dorsal " "
3. A dorsal direct fasciculus.
4. A ventral " "

1. The ventral crossed bundle is the one long known as the columna fornicis in its passage through the tuber cinereum to the corpus mammillare (Meynert's radix descendens fornicis). Its true origin and course were discovered by Ganser in 1878 by an experiment described on p. 252. The origin he found to be in the central gray near the third ventricle, but not from any distinct cell-group. In most animals these fibres of origin are scattered, and their course is difficult or even impossible to make out, but in rabbits (with a few individual exceptions), in mice, and moles the fibres are aggregated into considerable fasciculi, so that carmine, gold, and osmic preparations exhibit distinct pictures. As seen in the typical rabbit the fine bundles coming from the central gray run ventro-frontad; they are mediad of the fasciculi Meynerti. At a point caudad and dorsad of the medial ganglia of the corpus mammillare these fine bundles completely decussate; they now form a large fasciculus on either side, which curves around the medial ganglion of the C. M., passes frontad between it and the lateral ganglion. It apparently issues from the frontal aspect of the C. M. into the tuber cinereum, takes a direction dorso-latero-frontad to a level dorsad of the commissura anterior,

where it enters into the formation of the root of the fornix.

2. The dorsal crossed bundle joins No. 1 at a point frontad of the tuber cinereum. It is demonstrated by the previously cited experiment of removal of one hemisphere and of its cornu Ammonis without injury to the root of the fornix (region where columnæ fornicis enter fornix). In a series of trans-sections from such a brain, one sees, as stated *supra*, that fasciculus No. 1 is completely absent caudad of C. M. in it, and in the tuber cinereum; but in the sections frontad of this point, at the level of the commissura anterior, a bundle of transversely-cut nerve fibres is seen close to the site of the atrophied columna fornicis—just mediad of it. These fibres are pale; they have taken up much less carmine than those of the normal fasciculus No. 1 on the opposite side. Still further frontad, over the commissura anterior, these fibres diverge toward the median line, cross it, and enter the fornix of the opposite non-operated side. Indeed, without special preparation, after this experiment, by turning what remains of the fornix over frontad, it is easy to see with the naked eye a fasciculus passing from the normal half of the fornix ventrad toward the median line. In the sections it is also evident that this fasciculus (No. 2) is absent in the column opposite the injury, while its main bundle (No. 1) is present.

3. The dorsal direct bundle is made evident by Ganser's experiment of wound in the tuber cinereum p. 253. The inferior fasciculus (No. 1) is absent on one side in the sections, but dorsad of the commissura anterior there appears near the site of the absent bundle a round section of fibres. These can be traced caudad in the series of sections; it spreads latero-dorsad, describing a curve with convexity outward, to reach the dorso-lateral part of the thalamus, where it *seems* connected with a cell-group. It may, however, have an origin at a point further ventrad in the curve,

where there is a nest of larger cells. In this course the fibres of fasciculus No. 3 enter into the formation of the stratum zonale. As seen dorsad of the commissura anterior its fibres are smaller than those of fasciculi 1 and 2. After removal of one Ammon's horn it undergoes atrophy on the same side as the injury. If von Gudden were sure that this fasciculus (No. 3) ended in the above-mentioned cell-group in the thalamus, he would call it the *thalamic root of the fornix*, but he now prefers to call it the dorsal direct bundle.

4. The ventral direct bundle.<sup>1</sup> After Ganser's experiment in sections through the tuber cinereum, two or three little stained fasciculi (cross-cut) are seen to join the columna fornicis, or on the operated side to tend toward its site. Their ultimate course frontad is unknown, but it is certain that they undergo atrophy on the same side as the injury when the cornu Ammonis is removed on one side. Caudad the small bundles can be traced in a direction ventro-medio-dorsad into the central gray matter frontad of corpus mammillare: a distinct nucleus has not been observed.

Prof. v. Gudden believes that bundles 1 and 4 contribute to form that part of the fornix which lies under the corpus callosum and is known as the longitudinal fornix. Bundles 2 and 3 diverge and take a dorso-laterad course in the fornix.

The tænia thalamia crosses bundle No. 3, passes caudad of it without giving it any fibres. This is distinctly seen in such atrophy preparations as involve atrophy of the entire columna fornicis; the cross-section of the tænia has the same diameter on either side. Neither have any of the preparations afforded evidence of a connection between the columna fornicis and the stria cornea.

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<sup>1</sup> Unpublished.

*XV.—Fasciculus ad tegmentum (Haubenbündel).<sup>1</sup>*

This was partly described by Prof. von Gudden in his paper on the corpus mamillare (1880). He then correctly described its course, but its true origin, and more especially its termination in a distinct ganglion in the tegmentum, were not discovered until this year, and I have the privilege of first making the facts public.

Origin of the fasciculus. In sections from a rabbit which had undergone removal of one hemisphere together with the anterior part of the thalamus, the fasciculus Vicq D' Azyr is completely absent on the operated side, and the medial ganglion of the corpus mamillare to a great extent atrophied. However, one sees in the trans-sections, a fasciculus arising from the remains of the medial ganglion of the corpus mamillare; it extends a little way dorsad, then turns abruptly ventro-caudad to enter the tegmentum.

In a very successful (*i.e.*, in the right plane) horizontal section from a normal rabbit brain the horizontal course of the fasciculus can be traced a long way. In the frontal part of such a preparation are the commissura anterior and cross-sections of the columnæ fornicis; then, proceeding caudad, in the median line the slit-like opening of the third ventricle; on either side of this a large bundle is seen in cross-section, the fasciculus Vicq D' Azyr; from this a bundle of fibres diverges caudad, tending toward the median line; it passes mediad of another large bundle seen in cross-section, viz.: the fasciculus Meynerti; a little further caudad it lies mediad of the emerging roots (cross-cut) of N. iii, and finally is lost very near the median line, just ventrad of the fasciculus longitudinalis posterior.

The exact caudad connection (termination) of the fasc. ad tegmentum was ascertained by the following experiment.

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<sup>1</sup> Unpublished.

By passing a very delicate knife vertically through the corpus callosum to the base of the brain, the chiasm and one medial ganglion of the corpus mammillare were divided. [Ganser's experiment of injury to medial ganglion by passing a forceps through the foramen opticum in a kitten also afforded a similar demonstration.] The study of trans-sections from these two cases showed the following results in parts caudad of the injured ganglion. There was no trace of the fasc. ad tegmentum on the side of the injury, and this atrophy could easily be traced as far back as a point a little caudad of N. iv, ventrad of the fasc. long. post. Then on the normal side is a beautiful well-defined cell-group, of which there is no trace on the side of the absent fasciculus. Both in the cat and rabbit the demonstration of this new ganglion was most conclusive.

Now that the terminal cell-group is known it is easy, in horizontal trans-sections from normal brains, to trace the fasc. ad tegmentum all the way from its origin to its termination.

Observing more closely the mode of origin of the (conjoined) fasc. ad tegmentum and the fasc. Vicq D' Azyr, by means of numerous series of sections, von Gudden has recently discovered that the medial ganglion of the corpus mammillare is composed of two distinct cell-groups or nuclei: a dorso-frontal nucleus which gives origin to the fasc. ad tegmentum, and a ventro-caudal mass from which springs the fasc. Vicq D' Azyr. This constitutes an addition to our knowledge of the corpus mammillare, as stated on p. 250.

I propose the term fasciculus ad tegmentum for the German noun *Haubenbündel*. This has Prof. Gudden's approval.

*XVI.—Corpus restiforme and Deiters' nucleus.*

Dr. C. von Monakow, assistant physician of the asylum of

St. Pirminsborg, in Pfäfers, near Rogatz, has carried on a number of most interesting researches by Gudden's method. He has more especially occupied himself with the cortex cerebri and basal ganglia, a field not specially entered upon by Gudden. He also made one experiment upon more peripheral parts,<sup>1</sup> which it is best to analyze immediately after Gudden's studies.

Dr. Monakow gives an historical account of Deiters' nucleus, or the so-called external acoustic nucleus.

EXPT.—In a newly-born rabbit, left hemi-section of the spinal cord, just below the decussation.

Physiological results: Complete left hemiplegia with nearly complete recovery later. At first little reaction to needle-pricks on both sides of body, but later was more marked (though incomplete) on the left side. State of face not specially stated.

Autopsy in six months.

Gross changes: Hemi-section not quite complete; a part, inner half, of fasciculus gracilis (Goll's column) and a small part of the anterior column remain. Evident ascending degeneration in medulla. Left side of cord smaller caudad of section. Left vermis superior cerebelli flatter.

Microscopic examination of sections as far frontad as thalamus.

(a) Changes frontad of injury: (1) Complete atrophy of fasciculus cuneatus and its nucleus; (2) partial atrophy of fasciculus gracilis and its nucleus; (3) complete atrophy of fasciculus ad cerebellum; (4) corpus restiforme reduced one half, atrophied chiefly in its medial part; (5) the atrophy of the nucleus of the fasc. cuneatus is by far more marked in its lateral mass, which can be traced to the caudal level of N. viii roots (the medial nucleus is reduced one third without evident histological changes); (6) the inner division of the processus ad medullam (or ascending N. viii of Roller) is but slightly altered—at level of true N. viii roots it is smaller on the operated side, because of absence of fibres coming to it horizontally from corpus restiforme; (7) at this level the large cells of Deiters' nucleus are nearly all lost on the same side as the injury, more especially in its latero-dorsal aspect—this atrophy blends with that of the adjacent corpus restiforme—the

<sup>1</sup> Monakow, *Experimenteller Beitrag zur Kenntniss des Corpus Restiforme, des "äusseren Acusticuskerns," und deren Beziehungen zum Rückenmark.*—*Westphal's Archiv*, Bd. xiv, Hft. 1.

acoustic root-fibres which apparently arise from this nucleus are seen perfectly intact in the wasted nucleus—all these roots are normal and equal on the two sides; (8) in the cerebellum the atrophy can be indistinctly traced into the vermis superior, whose cortex and medulla are certainly less developed than on the healthy side; (9) the left nucleus lateralis is almost wholly atrophied (*vide* ¶ vi, on origin of processus ad medullam); (10) the left formatio reticularis in its lateral part is generally reduced and poorer in cells, a condition which can be traced as far frontad as the lobus opticus; (11) the pyramid opposite the injury is slightly smaller, but after a short distance frontad this atrophy ceases; (12) the prolongation of the lemniscus (*Schleif*) in the medulla is slightly atrophied on the same side as the injury. No changes in lobi optici or beyond; these were particularly searched for, as Monakow's principal idea in making the experiment was to trace an ascending atrophy to the brain.

(b) Changes caudad of the injury: Complete atrophy of pyramid below hemi-section, on same side of course.

The perfectly normal parts of medulla are the medial part of formatio reticularis, the fasc. long. post. (continuation of anterior column?), the upper olives, and all the nerve nuclei and roots. The lower olive on the operated side is a trifle smaller on the operated side, and the same is true of the ascending root of N. v, but the word atrophy can hardly be applied.

Conclusions: 1. That the processus ad medullam (*vide* ¶ vi) is made up of several bundles: of the processus ad cerebellum (*Kleinhirnseitenstrangbahn*), fibræ arcuatæ, fibres from both olives and the formatio reticularis, and largely in its medial portion of fibres derived from the fasciculus cuneatus through its lateral nucleus.

2. This last portion of the atrophied corpus restiforme can be traced to a connection with the large cells of Deiters' nucleus.

3. Deiters' nucleus is certainly not connected with the acoustic nerve.

4. The atrophic fasciculus ad cerebellum is in relation with the caudal part of the vermis superior (compare p. 239, on connection of processus ad cerebrum, with frontal part of vermis, as shown by Forel).

The most important result of this experiment is that concerning the relations of Deiters' nucleus. With singular unanimity it is considered by anatomists as the outer acoustic nucleus, because they have traced root-fibres of N. viii into it. So recent an authority as Spitzka<sup>1</sup> not only admits it as a nucleus of N. viii, but declines to consider the usual division into an internal and external nucleus. If any anatomist could see, as I have seen, the N. viii fibres absolutely normal in the area of Deiters' nucleus while almost all the cells were absent, he would begin to reflect on the uncertainty of the simple study of normal sections, however carefully or conscientiously carried out. The annals of encephalic anatomy are replete with the errors due to exclusive devotion to the Rolando-Stilling method, and it is high time that its delusive teachings be corrected by the other special methods of research.

*XVII.—Relation of cortex cerebri to adjacent parts.*

The most important researches of Dr. von Monakow, those which are in all respects his own, and which, if confirmed, will add greatly to our comprehension of cerebral architecture and physiology, are those upon the relations between cortical areas and portions of the thalamus, the corpora geniculata, and the lobus opticus. A portion of his experiments have already appeared in print,<sup>2</sup> and two other contributions were made this year to the German and the Swiss Science Congresses respectively. He was led to undertake these researches partly by Munk's physiological experiments, and partly by the fact, noted several times by Gudden, that after removal of one hemisphere in the rabbit,

<sup>1</sup> "Contributions to Encephalic Anatomy," chapter i, appendix note 42.—*Journal of Nervous and Mental Disease*, April, 1880.

<sup>2</sup> Ueber einige durch Extirpation circumscripitar Hirnrindenregionen bedingte Entwicklungshemmungen des Kaninchengehirns.—*Arch. f. Psychiatrie*, Bd. xii, Heft 1.

Weitere Mittheilungen über durch Extirpation circumscripitar Hirnrindenregion bedingte Entwicklungshemmungen des Kaninchens.—*Idem*, Heft 3.

the thalamus of the same side was smaller. He also admits that Luys has for some time taught that definite regions of the cortex stood in relation to definite portions or nuclei of the thalamus, but this from pure theory.

After a few experiments on kittens, he was obliged, because of great mortality, to use rabbits, which he did with regret, because of their slight intelligence (compare Gudden and Ganser, whose rabbits seemed normal after removal of one hemisphere).

EXPT. 1.—A portion of cortex and white substance of right hemisphere was removed from the parietal gyrus near the longitudinal fissure. This region M. considers to be just caudad of Ferrier's and Fürstner's area No. 6 (see fig. 1); about equivalent to Hitzig's No. 1 area in dogs and monkeys; and also to Munk's centre for the leg. Caudad and laterad of extirpated region are Munk's region for the sensibility of the eye, and further his visual sphere. The extirpated zone is marked *a* in fig. 1.

Results: The nucleus externus of right thalamus is totally atrophied. Right corpus geniculatum laterale much atrophied, chiefly in its caudal portion. Right trapezium, pyramid, and lateral lemniscus a little smaller than their homologues. A part of the internal capsule in relation with the wound is atrophied. The lateral part of the crus cerebri is small, and the formatio reticularis reduced.

EXPT. 2.—Removal of a portion of left occipital lobe (A. in fig. 1). Considers spot injured as equivalent to Ferrier's and Fürstner's centre No. 9, and to Munk's area A, the visual sphere of the dog.

Results: Slight atrophy of medullary substance near cicatrix, of caudal part of left internal capsule; great atrophy of left corpus geniculatum laterale and of tractus opticus, of left tractus peduncularis transversus, of the outer part of the nucleus externus of the thalamus. The left lobus opticus is slightly flattened; the right optic nerve a little smaller than its fellow.

Conclusions: The atrophy extended from the visual sphere to the corpus geniculatum laterale and slightly to the rest of the optic apparatus; it was in inverse degree to what follows enucleation of the eyeball. The corpus geniculatum laterale is, therefore, a centre for vision in

association with the cortical centre; the outer part of the nucleus externus which the author considers equivalent to the pulvinar,<sup>1</sup> is also a part of the optic apparatus.

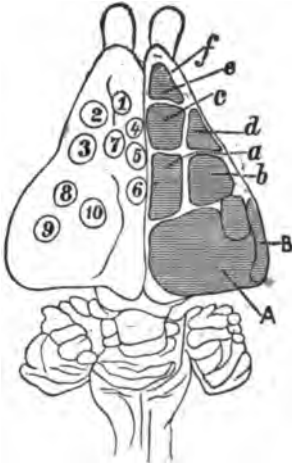


FIG. 1.<sup>2</sup>

The second article contains the following numerous experiments :

<sup>1</sup> Forel has shown that the lower mammals have no true pulvinar.

Monakow adds some remarks on the nomenclature of the nuclei of the thalamus, and follows Ganser's (*Gehirn der Maulwurfs*, *Morphol. Jahrbuch*, Bd. vii, p. 711) arrangement, into nucleus anterior (tuberculum anterior), nucleus internus, nucleus externus, and nucleus posterior.

<sup>2</sup> Explanation of cuts in the original articles.

Fig. 1.—Right hemisphere slightly modified from Monakow.

A. Zone of corp. gen. ext.

B. Zone of corp. gen. int.

a. Zone of optic thalamus.

b. Zone of stratum reticulare.

d. Zone d.

e and f. Zone of nucleus internus.

On the left hemisphere are placed the motor centres of Ferrier, as depicted in Fürstner's article, *Westphal's Archiv*, vol. vi, p. 725.

1. Raising of upper lip; rotation of head to right.

2. Drawing of mouth to right; masticatory movements on right; drawing of head to right.

3. The same.

4. Raising the right shoulder; extending the toes.

5. Retraction and adduction of the right paw; extension of toes.

6. Epileptic seizure.

7. Masticatory movements with the right upper lip and jaws; drawing of the head toward the left.

8. Shutting the eyes.

9. The same.

10. Indefinite.

Fig. 2.—Profile view of right hemisphere of figure 1.

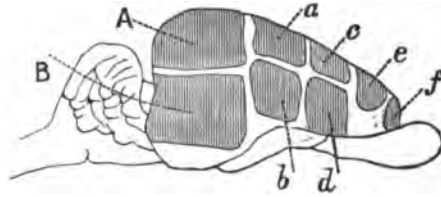


FIG. 2.<sup>3</sup>

EXPT. 1.—Removal of zone *b*, fig. 1. Results : Atrophy of part of internal capsule (its third fifth about), extending from the wound centrally ; of nervous tissue laterad of the nucleus anterior of the thalamus (not atrophied). A slight atrophy of the corpus geniculatum laterale M. thinks is due to encroachment of lesion upon zone A. The lateral part of the crus cerebri is slightly reduced in size. Considers the part most atrophied in this experiment, the lateral adjunct to the nucleus antierius as the stratum reticulare (frontal part of *Gitterschicht*). Zone *b* is therefore the centre for the stratum reticulare.

EXPT. 2.—Extirpation of zone B. This area occupies the greater part of the temporal lobe, and corresponds with Munk's auditory sphere B in dogs and monkeys. Results : Atrophy of connected fasciculus of corona radiata and internal capsule (caudo-ventral part), and of the corpus geniculatum mediale. There is also slight atrophy of the caudal part of the stratum reticulare (*Gitterschicht*). No changes could be detected in the acoustic nerve and its nucleus.

Conclusion : Zone B is the centre for the corpus geniculatum mediale. Query : Is the corp. gen. med. a primary centre for hearing as the corp. gen. lat. is for vision ?

EXPT. 3.—Extirpation of extreme frontal end of hemisphere *f* and a part of *e* in fig. 1. Results : Atrophy of basal part of capsula interna, without and within the corpus striatum, and of a part of the nucleus internus. Corpus striatum preserved. Pyramidal tract partly atrophied.

EXPT. 4.—Removal of zone *d*, including some of *b*. Results : Atrophy of corresponding part of internal capsule, and of caudal part of stratum reticulare.

EXPT. 5.—Extirpation of area including *c*, *d*, *e*. These zones are frontad of *a* and *b*, and include nearly all the motor centres of Ferrier and Fürstner : its medial part corresponds to the paracentral lobule. Results : Atrophy of dependent fasciculi of internal capsule, without and within the corpus striatum (which is normal) ; atrophy of tuberculum antierius (nucleus antierius) to one half its normal size, an atrophy equally distributed in its two cell-groups. Thence the atrophy can be followed in two paths, separated by normal fibres coming from other parts of the brain : (*a*) The ventral atrophy involves the pyramidal tract (medial part of crus cerebri) ; the corresponding pyramid is al-

most totally atrophied, and the opposite half of the spinal cord contains the well-known crossed pyramidal atrophy. The corpus Luysii and the substantia nigra on the side of the injury are reduced in volume. (*b*) The dorsal atrophy expands into the area made up partly by the stratum reticulare, and by the laminæ medullares ext. The nucleus internus is slightly atrophied. The fasciculus Vicq D' Azyr is small, but not reduced in a degree corresponding with the atrophy of the nucleus anterieus. Still another atrophy is produced by this operation, viz.: that of a longitudinal fasciculus in the white substance of the hemisphere, in its dorsal part, extending to the occipital lobe (fasciculus longitudinalis superior). Areas *c, e, f* constitute a pyramidal zone.

Monakow also extirpated five smaller areas in *A*, and separately the areas *c, d, e*. The results agreed with those obtained by experiments detailed above. Altogether more than fifty experiments were made.

Summary: If we associated the cortical zones with those central nuclei which were most atrophied by their extirpation, we have the following list:

Zone *A*, or visual sphere, is related to the corpus geniculatum laterale.

Zone *a* is related to the nucleus externus.

Zone *b* is related to the stratum reticulare.

Zone *B* is related to the corpus geniculatum mediale.

Zones *c, d, e* are related to the nucleus anterior and nucleus internus.

Zones *c, e, f* are related to the pyramidal tract.

It is observable that the nucleus posterior does not suffer in any of these experiments: very probably it is connected with strictly basal parts of the cortex.

Monakow believes, in consequence of these experiments, that each cortical area or zone is connected with more than one path or tract.

That the various nuclei of the thalamus as well as the corpora geniculata stand in definite relations to circumscribed cortical areas.

That the corpora geniculata medialis et lateralis are ana-

logues of the nuclei of the thalamus and should be considered as associated with them.

*XVIII.—Connections of the cortical visual area with the optic apparatus.*

EXPT.<sup>1</sup> 1.—In a newly-born kitten removal of a large part of the parietal cortex and the subjacent white substance on one side. Autopsy in six months. Results: Sections frontad of wound show great atrophy of cortex of motor gyri and of the underlying white substance on the same side as the injury. Microscopic examination shows that the atrophy bears chiefly upon the third layer of cells in the cortex, that containing the larger ganglion cells (giant-cells of Betz); these are entirely absent. Section in the injured region; the corpus striatum is normal, but the fasciculi of the internal capsule which normally traverse it are absent,<sup>2</sup> except the ventral bundle derived from the lobus olfactorius. The optic nerve of the same side is smaller (its transverse diameter is less) than its fellow; this being due, in Monakow's opinion, to absence (atrophy) of the fasciculus lateralis, which has a connection with the cortical visual area (encroached upon by the wound). Further caudad the tractus opticus is smaller on the operated side; the tuberculum anterius (nucleus anterior) of the thalamus is wholly atrophied. The commissura anterior and the temporal lobe are normal. The nucleus externus thalami is almost wholly atrophied, while the nucleus internus is preserved. The part dorsad of the corpus geniculatum lat., which M. holds to be the equivalent of the human pulvinar, is fairly preserved. The corp. genic. lat. itself is somewhat reduced, but the mediale is normal. The lobus opticus on the injured side is smaller than its fellow, having suffered atrophy in its middle medullary layer. The medial part of the crus cerebri is much atrophied, and the lemniscus less developed on the injured side. The fasc. Vicq d'Azyr and medial ganglion of the corpus mammillare are partly atrophied. In the tegmentum there is absence of the pyramidal tract and diminution of the lemniscus. In the caudal part of the pons there is no pyramid on the side of injury, but the slight atrophy of the lemniscus gradually ceases.

<sup>1</sup> Experimentelle Untersuchungen über umschriebene Hirnrindenatrophien. Vortrag gehalten an der 56 Versammlung Deutscher Naturforscher und Aerzte. Freiburg, Sept., 1883.

<sup>2</sup> Von Gudden obtained a similar result in his experiment of removal of the motor gyri, *vide p.* 238.

EXPT.<sup>1</sup> 2.—In a newly-born rabbit, a simple oblique stabbing wound was made with a narrow knife in the temporal lobe, in a medio-ventrad direction. Autopsy in three and a half weeks. It was found that the caudal part of the internal capsule (Gratiolet's optic fasciculus), its connection with the corpus geniculatum mediale, and the tractus opticus, had been divided; the crus cerebri very slightly injured.

Results: Sections through the brain frontad of the injury showed the cortex normal, but its internal capsule less developed; caudad of the injury, in the occipital lobe there is marked atrophy of the cortex and white substance, due to section of the internal capsule. There is complete atrophy of the corpus geniculatum laterale (greater than can be accounted for by section of the tractus opticus). The lobus opticus on the same side as the injury is distinctly smaller. The corp genic. mediale is completely atrophied from section of the fibres connecting it with the internal capsule. The various nuclei of the thalamus are normal. Microscopic examination of the atrophied occipital cortex showed that the atrophy affected mainly the third layer, or layer of large ganglion cells; they were entirely absent. The cells of the fifth layer were slightly reduced. In the small lobus opticus it is seen that the atrophy bears chiefly upon the superficial medullary layer, whose cells are fewer and smaller. After removal of the visual area alone (B in fig. 1), the atrophy of the lobus opticus is not of these cells, but is most marked in the middle medullary layer. In the above-detailed experiment there is also some atrophy of this layer, because a part of the optic fasciculus going to the cortex was injured. The atrophy of the superficial medullary layer is, however, much greater than after enucleation of one eyeball.

*The results of these experiments, Monakow's first and second set of experiments upon the relations of the cortex and the thalamic nuclei (including the corpora geniculata).*

What is more important, and what, if confirmed, will form an epoch in this department of experimental physiology, is the production of an ascending (centripetal) atrophy of the cortex by section of fasciculi of the internal

<sup>1</sup> Ueber die Ursprungscentren des Nervus Opticus, und deren Beziehungen zur Grosshirnrinde. Vortrag gehalten an der 66 Versammlung der Schweizerischen Naturforschenden Gesellschaft, Zürich, August, 1883.

capsule. It will be remembered that both Gudden and Monakow (see corpus restiforme) have shown that after section of the pyramidal tract low down (caudad) there was no ascending (centripetal) degeneration, or at most only in a very slight degree for a millimetre or two. But in both the last experiments section of the internal capsule (in expt. 1 its frontal division, in expt. 2 its occipital division) caused distinct atrophy of the associated cortical regions, in which mainly the third cell-layer (that of giant-cells) was atrophied.

The first experiment also corroborates Gudden's finding, that the corpus striatum has no corona radiata.

Another important result (of expt. 1) is the apparent demonstration that there is a degree of anatomical continuity between the cortical visual area and the optic *nerve* (its fasciculus lateralis). This is in opposition to von Gudden's results.

The general agreement between the results of physiologists (Munk, Hitzig, Ferrier, and others) and those of von Monakow is striking, and affords supplementary evidence of their approximate exactness.

Dr. von Monakow has recently made an autopsy of a human case<sup>1</sup> which strongly supports his and Munk's experiments on the visual cortical area.

There was in this case an old (probably five years old, judging by the imperfect history of the case) yellow patch (softening due to blockade of branches of the right posterior cerebral artery) in the right occipital lobe, more especially destroying the cuneus. Previous to the patient's reception in the asylum he had had "imperfect vision," which was explained by finding homonymous hemianopsia. In sections, one can trace, in the clearest manner, a band of degeneration from the patch in the occipital division of the internal capsule (Gratiolet's optic fasciculus) frontad and mediad to the corpus geniculatum laterale and pulvinar. The pulvinar is al-

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<sup>1</sup> Unpublished.

most entirely atrophied, and the corp. genic. lat. largely so ; its folds are absent. The crus of the lobus opticus (brachium) is also in a state of secondary degeneration (granular cells, excessive staining by carmine). These changes border closely on the corp. genic. mediale which is normal, a fact which speaks positively against a primary disease here (besides the blood-vessels of this region were healthy). The lobi optici are equal and present no changes to the naked eye, but microscopic examination shows that in the right lobus the middle medullary layer (*mittleres Mark* of Ganser) contains fewer and smaller cross-cut bundles of nerve fibres. The atrophy is about the same as in Ganser's rat B (*vide* p. 142 of ARCHIVES for October). The lateral and medial parts of the lemniscus are smaller on the side of the lesion. It should be stated that further frontad the lateral part of the corp. genic. lat. is completely atrophied, while its medial part is preserved ; von Monakow is disposed to conclude that the former is connected with the cuneus, while the latter receives its innervation from the rest of the visual cortical area.

The tractus opticus on the side of the lesion is much reduced in size. Beyond the chiasm, the atrophy is traceable in both optic nerves ; the degenerated part standing out clearly marked by an excess of carmine. The right optic nerve exhibits a patch of degeneration in its lateral aspect (fasciculus lateralis) ; the left nerve, in its medial aspect (fasciculus cruciatus).

*XIX.—Connections of the optic nerve with the "primary optic centres."*<sup>1</sup>

EXPT. 1.—In a newly-born rabbit, one eyeball was enucleated. Autopsy after one year. Results : Complete atrophy of injured optic nerve ; atrophy of tractus opticus on the opposite side of its fibres overlying the corp. geniculatum lat. Also atrophy of this nucleus, more especially in its lateral part. Microscopic examination shows that this atrophy affects the fundamental or intercellular substance, and that the peculiar globular cells are about as on the normal side, only very much closer together. The lobus opticus is somewhat smaller on the side opposite the injury, and microscopic examination shows that the atrophy involves both cells and fibres in the superficial medullary layer (*oberflächliches Mark* of Ganser). No change in the cortex cerebri. In considering this experiment it should be borne in mind that in the rabbit the optic nerves almost totally decussate.

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<sup>1</sup> Unpublished.

EXPT. 2.—In a newly-born kitten, one eyeball was enucleated. Autopsy in three months. Results : Complete atrophy of injured optic nerve ; both tractus optici are smaller than normal, the one opposite the lesion a little flatter than its fellow. [The optic decussation in cats is considered by M. to be nearly equal.] Both corpora genic. lat. are smaller, as are also the adjacent regions equivalent to the pulvinar. The streaks normally present in the corp. genic. lat. are absent, and the lateral aspects of the pulvinars exhibit an atrophic indentation. The lobi optici are about equally reduced in size, and microscopic examination shows the atrophy to bear chiefly upon the superficial medullary layer (Ganser's *oberflächliches Mark*), mostly in its fibres, but also somewhat in its ganglion cells.

I cannot close this review without expressing my appreciation of the courtesy with which Doctor von Monakow received me at St. Pirminsberg, and the pains he took to demonstrate all his preparations. He, as well as Professor von Gudden, have allowed me to make use of unpublished material, and its appearance in the ARCHIVES OF MEDICINE is to be considered as preliminary original communications from these gentlemen.

## ON DYSPNŒA.\*

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**A**MONG the many groups of symptoms which come under the observation of the practical physician, none is more important than that by means of which the condition of dyspnœa is made manifest.

Dyspnœa is an embarrassment of the function of respiration. It is imperfect oxygenation of the hæmoglobin. The symptoms which indicate its presence are, subjectively, the sensation of suffocation, and, objectively, the appearances produced by increased respiratory effort, carbonic-acid poisoning, and increased venosity of the blood. In order to properly appreciate the causes of dyspnœa it will be necessary to consider, first, the factors concerned in the carrying on of normal respiration. These are: first, the lungs; second, the upper air-passages, through which the atmosphere is admitted to contact with the pulmonary tissue; third, the thoracic walls, through whose movements the entrance and exit of air are conditioned; fourth, the pleural membranes; fifth, the muscles which act upon the thoracic walls; sixth, the nervous mechanism; seventh, the circulatory apparatus; eighth, the conditions of the surrounding media. The part played by these factors is suf-

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\* One of a course of lectures on Symptomatology, delivered before the Chi Phi Delta Fraternity, at the Long Island College Hospital.

ficiently well understood, and I will not take the time to consider them in detail.

It may be useful, however, with the object of preparing our minds for the consideration of the main topic of the evening, to review the normal course of the respiratory function.

In the depths of the oblong medulla, just above the point of the calamus scriptorius, is a ganglionic station whose function it is to regulate the contractions of the respiratory muscles. It is known to physiologists as the *respiratory centre*. We cannot take the time to trace the history of its evolution, even were I competent to the performance of so difficult a task; but must begin with the fact that, in the development of the embryo, this, like other organs, which will only come into service later in life, attains its proper growth.

During foetal life the blood is thoroughly aërated through the placental circulation; but when this is cut off, by the expulsion of the child from the body of its mother, the lack of oxygen is quickly felt at this central station, and discharges occur, which, being transmitted along the efferent nerves, liberate the force of the muscles of respiration. With the expansion of the thorax, important phenomena occur, viz.: the separation of the walls of the cavity opens not only the bronchioles and air-sacs, but the pulmonary vessels also, drawing the blood from the pulmonary artery off into the lungs. By this means the pressure in the ductus arteriosus is diminished, the aortic and pulmonic currents are balanced, and as the current of blood through it has ceased, no obstacle is offered to the contractility of that vessel. The latter, accordingly, contracts, and its calibre is diminished, and finally obliterated. At the same time, the quantity of blood discharged by the pulmonary veins into the left auricle is increased sufficiently to distend

it and arrest the passage of venous blood into it through the foramen ovale. That foramen has muscular boundaries, which contract under the diminished pressure and, finally, close it. Then, the venous blood all passes into the right ventricle, thence into the pulmonary artery, and is poured into the capillary net-work of the parenchyma of the lung, where its contact with the atmospheric air permits of its proper oxygenation.

If we return to the respiratory centre, and examine its anatomical relations, we shall find that it is, truly, the central station for respiratory impulses. The connections of its ganglion cells are as follows: Issuing from the sides of the medulla, above are the facial nerves of either side; below these are the glosso-pharyngeal nerves. These two supply efferent or motor fibres to the nostrils, mouth, soft palate, and pharynx. Then come the pneumogastrics, which form pharyngeal plexuses with the two preceding nerves, and give fibres to the larynx, trachea, bronchi, and pulmonary parenchyma. Below the vagi, the spinal accessories emerge, and innervate the superior muscles of inspiration. After these, the phrenics pursue their course downward, through the mediastinal space, to the diaphragm. Still lower down the other spinal nerves supply those muscles of the thorax and abdomen, which are concerned in the respiratory process; they convey motor impulses to the intercostal and other muscles of the trunk. The anatomical connection of the nerves last mentioned with the respiratory centre has not been demonstrated, but their communication, direct or indirect, is rendered indubitable by the phenomena of respiration. Indeed, it would seem, from the constant and immediate physiological relation between the intercostal muscles and the medulla, that there must be fibres which pass directly and without interruption from one to the other. Other phenomena, particularly the

effects of psychical disturbances upon the respiratory acts, render it certain that there are connections higher up, with the cerebrum.

Under the influence of the diminished amount of oxygen in the hæmoglobin, which occurs, in normal breathing, eighteen to twenty times per minute, moderate discharges occur, which pass out on the fibres most directly connected with the ganglion cells of the respiratory centre, viz., the pneumogastric, spinal accessory, phrenic, and intercostal nerves. If the amount of oxygen be still further diminished, the discharges are more violent, and overflow into the more remote channels, the facial above, and the nerves supplying the dorsal and abdominal muscles below. The alæ nasi are then seen to dilate with the inspiratory acts, the mouth is held open, and the heaving of the chest and abdomen is increased. This gives us the picture of "labored breathing." If the diminution of oxygen is carried still further, violent contractions of the entire muscular system may be produced.

An interesting and, as we shall see when I come, in a future paper, to treat of cough as a symptom of disease, an instructive fact, in connection with these more intense excitations of the centre, has been observed by the physiologists. It has been found that, when the deprivation of oxygen has been carried to an extreme degree, the muscles of *expiration* are those most violently contracted, so that the convulsions which ensue fix the chest in the position of expiration. The accumulation of carbonic acid seems to have less effect upon the respiratory centre than upon the cerebral cells above, upon which its action is that of a narcotic poison.

After this hasty review of some of the data of the anatomy and physiology of respiration, let us pass to the study of the clinical features of diminished oxygenation, or dyspnœa.

Any one of the factors concerned in the normal breathing may, by its derangement, become a source of disturbance.

Thus, it is quite evident that any abnormal condition of the lung itself will interfere with its ærating function. Many of the diseased conditions of the upper air-passages, by offering obstruction to the free ebb and flow of the aërial tides, cause dyspnœa, sometimes to an intense and even fatal degree.

Fixation of the chest-walls is equivalent in its effects to stenosis of the air-tubes, though the dyspnœa from this cause does not often reach as high a grade, because the lower thoracic wall, the diaphragm, seldom loses its mobility completely at the same time that the ribs become stationary.

Diseased conditions of the pleural membranes are frequent causes of embarrassment of respiration. Adhesions of the surfaces will interfere with the changes of position by which the lungs accommodate their shape to that of the cavity in which they are enclosed; while accumulations of fluid, or other matters, in one or both pleural cavities, may interfere by direct compression, or, more correctly, by interfering with expansion. As for the circulation of blood through the lungs, the ways in which it may be obstructed are very numerous. Another condition, which frequently gives rise to dyspnœa, and which may be included under this head, is an altered condition of the blood itself; and that alteration may be either quantitative or qualitative. Diminished or spasmodic action of the respiratory muscles is sometimes seen: the first, in cases of great muscular weakness or degeneration; the second, in tetanic and other spasms,—for instance, in epileptic convulsions. These might, more properly, be classed in the next division.

Morbid conditions of the nervous mechanism of respiration are observed in such functional derangements as epilepsy, infantile convulsions, puerperal eclampsia, tetanus, spasm

of the adductor muscles of the vocal cords, and, again, in paralytic affections—such as paraplegia from injuries to the vertebræ, direct pressure of tumors upon the upper portion of the cord or on the medulla; degeneration of the ganglion cells of the medulla in diphtheritic paralysis; bulbar paralysis, locomotor ataxia, and the general paralysis of the insane. The direct pressure of aneurisms and tumors may also produce paralysis of the muscles of respiration. A very important paralysis, and one frequently overlooked by the general practitioner, is that of the abductor muscles of the vocal cords. In such a case, the opening of the chink of the glottis, which normally occurs with each inspiration, cannot be accomplished, and the consequent obstruction to the entrance of air may be so great as to cause asphyxia. Further, it is possible—nay, probable—that in injuries to the cerebral cortex and other portions of the upper brain, inhibitory influences are generated which impede, or even suspend, the action of the *respiratory centre*. I think that a close observation, *ante* and *post mortem*, of the head injuries shown you in the surgical wards, will impress upon your minds the truth of this statement. That the conditions of the surrounding media, viz., the atmospheric air, influence respiration, needs no elucidation here.

The question of the presence of dyspnœa, and its cause, will frequently come up in the examination of patients.

It is spoken of as *constant*, or as *dyspnœa on exertion*. In other words, it may be constantly present,—whether the person is lying down, sitting, standing, or walking; or it may only occur on the occasion of the patient's making exertion; though perfectly comfortable during our examination, he will tell us that, upon the taking of exercise, he feels short of breath. In its milder degrees, this latter form of dyspnœa only develops when some quite vigorous movement is made—such as running, walking uphill, or ascend-

ing a flight of stairs. In a more aggravated form, it will be felt even on walking moderately fast.

*Dyspnœa upon exertion* is present, first, in simple anæmia, and is due to the relative or absolute diminution in the number of the red blood corpuscles. These bodies may carry sufficient hæmoglobin to procure oxygen enough from the air for the ordinary nutrition of the tissues, when the body is at rest but, when the muscles are contracting actively, and increased oxidation occurs, the oxygen is extracted from the blood more rapidly than it can be taken up from the atmosphere, and dyspnœa is the result.

Simple bronchitis produces dyspnœa on exertion, through the narrowing of the tubes, resulting from the tumefaction of their mucous coats. This slight narrowing does not prevent the ingress of sufficient air to oxidize the hæmoglobin when the body is at rest; but, if the internal oxidation is increased for the production of muscular power, the difficulty of inspiration is immediately felt.

In *pulmonary emphysema*, still another form of impediment is met with, whose deleterious effects are felt on exertion.

Owing to the dilatation of the lungs, which cannot be entirely overcome by the muscles of expiration, the difference between expansion and contraction of the thorax is greatly diminished, so that the increased respiratory movements, necessary to the solicitation of a greater quantity of air into the chest, cannot be produced. In addition to this, the atrophy of the alveolar walls and their capillaries, characteristic of this disease, reduces the extent of ærating surface, so that, while there is enough for the requirements of quiet respiration, there is no reserve to meet the increased demands of the muscles during active movement.

Still another cause of this form of dyspnœa is found in the derangements of the pulmonary circulation, due to cardiac

and other vascular diseases. The condition of the lungs and air-passages may be favorable, but the disabled heart can only circulate the blood through them when the body is quiescent. Under the influence of exercise, the increased delivery of venous blood into the right side of the heart causes the presence of such an amount of that fluid in its cavities that it is unable to propel it rapidly enough through the pulmonary veins, obstructed as these are, for example, by a contracted mitral orifice. The blood accumulates in the great veins, and the arteries do not contain enough for the wants of the respiratory centre, which, consequently, discharges rapid and forcible motor impulses to the respiratory muscles, and, as we say, the person pants for breath.

Other less frequent causes of shortness of breath upon exertion might be mentioned, but I shall allude to only one of them. We should never forget that a slight or, in some cases, quite a considerable amount of fluid may be present in a pleural cavity, and yet produce no dyspnœa, when the patient is resting at home, or sitting quietly in the physician's office. Many such cases are overlooked, because we are too prone to neglect the examination of the base of the thorax, unless there are other well-marked symptoms calling our attention to the probable existence of a pneumonia or pleurisy.

If a patient complains of this form of dyspnœa, and no bronchitis, emphysema, or cardiac disease is detected by examining the chest anteriorly, we should never fail to carry our investigation to the posterior and dependent portions of the chest. Neglect of this precaution has been to the serious disadvantage of many a patient, and brought discredit on many a physician, for there is a latent form of pleurisy, unaccompanied by lancinating pain or fever, but resulting, like the more acute forms, in serous effusion.

When dyspnœa is *constant*, it is usually due either to an aggravated stage of one of the diseases already mentioned, or to one of the following: acute pleurisy, acute pneumonia, pericarditis with effusion, phthisis, peribronchitis, chronic interstitial pneumonia with or without bronchiectasis, fibrinous bronchitis, or laryngeal stenosis. The mechanism of all these conditions is readily understood. An exaggerated condition of this form of dyspnœa is known as orthopnœa. The sense of suffocation becomes so great when the patient assumes the recumbent position, that he is compelled to sit upright, or be bolstered up in bed. Orthopnœa is a frequent accompaniment of acute inflammatory diseases of the pulmonary parenchyma, pleura, and pericardium. It almost invariably accompanies extensive pulmonary œdema. In pericarditis and advanced cardiac disease, the erect posture favors the retention of the venous blood in the veins of the abdomen and lower extremities through the operation of the law of gravitation. This diminishes the accumulation in the right heart, and makes it work easier, because the portal vein and its tributaries are capable of containing all the blood in the body, particularly of an anæmic patient. In pleurisy with effusion, raising the shoulders allows the fluid to gravitate to the lower portion of the chest, and gives the upper portions of the lungs freedom of expansion and contraction. In pneumonia and pulmonary œdema, the same law is brought to bear upon the fluid secretions in the bronchial tubes.

There is a variety of orthopnœa which is apparently due to disturbed nervous influence, but its pathology is obscure, and we have not time to enter upon the discussion of it. Asthma usually causes marked orthopnœa, as I shall describe further on.

Besides the dyspnœa which is constant, and that which

only appears upon exertion, there is a third form, characterized by its occurring in paroxysms, *spasmodic dyspnœa*. In this variety there are intervals of either perfect or relative freedom from shortness of breath, alternating with attacks of dyspnœa, which is frequently urgent, and sometimes fatal.

The diseases characterized by paroxysmal dyspnœa are spasmodic croup; spasm of the laryngeal adductors from other causes; spasmodic asthma; thymic asthma; angina pectoris; aortic aneurism, and tumors compressing the pneumogastric nerves; chronic Bright's disease. It is, of course, impossible, in the short space of this lecture, to enter into a study of the pathology of these various diseases, but the essential feature of these cases is the presence of an aberrant nervous influence, operating in different ways. In spasmodic croup, the highly erethetic nervous mechanism of childhood is excited by an irritation originating in the laryngeal mucous membrane, and eventuating in a contraction of the adductor muscles of the vocal cords, by which the glottis is closed during inspiration, when it should be open. Spasmodic asthma has its peculiar lesion located farther down the tubes, which are narrowed, either from swelling of the mucous membrane, spasm of the circular muscular fibres, or both. Thymic asthma occurs in infants, and is a laryngeal spasm induced by pressure of the thymus upon the inferior laryngeal branch of the pneumogastric. The essential lesion of angina pectoris has not, as yet, been discovered. It is manifested in a spasm of the arterioles generally, which interferes with the circulation of blood to such an extent as to produce, in addition to the frightful pain and feeling of impending death, a well-marked dyspnœa. The asthmatic paroxysms of chronic Bright's disease are due, according to Dr. George Johnson, to spasm of the pulmonary arterioles, obstructing the passage of

blood through the lungs. Tumors and aneurisms induce spasm by their irritant effect upon the nerves which they compress.

Patients suffering from spasmodic dyspnœa usually assume the sitting posture, partly because the respiratory muscles can be more easily used with the body in that position, and partly on account of some nervous vaso-motor condition not yet explained.

In the examination of patients, it is necessary to distinguish between dyspnœa and simple accelerated breathing, and also between true and false dyspnœa.

Pyrexia is usually accompanied by increased rapidity of respiration; this increase is not, however, as marked as where there is actual obstruction to respiration. The heated blood, coming in contact with the ganglion cells of the medulla, is, apparently, the exciting cause of the greater rapidity of the discharges. In individuals of an excitable nervous organization, and particularly in infants and children, the respirations may be greatly increased in frequency from this cause. It will be found, upon careful observation, that these rapid movements are very superficial, causing little if any actual increase in the amount of air respired. This is an important point to the diagnostician, for we are sometimes in doubt as to the true significance of this symptom. Careful auscultation and the observation of the superficial nature of the breathing are our best aids under such circumstances.

This paper would be incomplete if I failed to call attention to a group of symptoms for which I propose the name of *hallucinatory*, or *false dyspnœa*. The instances that have come under my notice have been in women, of a neurotic tendency, but who did not, at the time of the examination, exhibit any of the ordinary hysterical symptoms. The sensation of suffocation is genuine and intense. The

patient sits up in bed, with anxious face, laboring for breath. But the face and mucous membranes show no signs of cyanosis, and the heaving of the chest, with free expansion and contraction, shows that there is no obstruction to respiration. Percussion and auscultation give no signs, save those of a healthy chest. The distress, evidently, has its origin in disturbance of some higher centre, the medulla being stimulated from above. The condition seems to be analogous to hallucinations of sight, hearing, etc., in which the central disturbance is referred, in consciousness, to the periphery.

It is possible that the spasmodic dyspnœa of Bright's disease is of somewhat similar character.

## METALLO-THERAPY, THEORETICALLY AND PRACTICALLY CONSIDERED.

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### PART II.—METALLO-THERAPY, PRACTICALLY CONSIDERED.

SINCE metallo-therapy is what Charcot calls the “grand *chef-d'œuvre* of empiricism,” the profit which arises from the investigation of the subject comes not so much from a discussion of its interesting and elusive theories as from a review of the cases in which it has been found serviceable, and in answering the questions: “What are the effects produced,—what are the methods of its application?”

The word metallo-therapy in this part of the article will be used in its strictest sense, that is, to designate the employment of metals and not other *æsthésiogènes* in the healing of disease.

#### *Report of Cases.*

By far the greater number of cases reported improved or cured by metallo-therapy have been those of the hypo-neuroses. The impression prevails that the metals can only be used in hysterical cases, especially those accompanied by anæsthesia of general and special sensibility. Charcot found, as has already been stated, that the effect of metals upon anæsthesia where cerebral lesions existed was more speedy and lasting.

If space permitted it would be very interesting to quote some of the typical cases of anæsthesia, hysterical and otherwise, which have been improved by the use of metals. As it is I can do little more than to catalogue them. Foremost are those published by the Committee of the Société de Biologie, which are models of careful scientific investigation.<sup>1</sup> Among the earliest reported cases are those of Despine,<sup>2</sup> in which hysterical affections were cured or ameliorated by gold. Charcot<sup>3</sup> has published a number of cases which prove the efficacy of this treatment in these diseases. Decrand,<sup>4</sup> Mouricourt,<sup>5</sup> Landouzy,<sup>6</sup> and Garel<sup>7</sup> have put on record cases of hysteria cured by gold, sometimes used externally, at other times used both externally and internally. The interesting experiments of Westphal<sup>8</sup> should be alluded to. Eulenburg<sup>9</sup> reports a case of chlorotic anæsthesia cured by the external and internal administration of gold, after the trial of iron, steel, and copper, tin, zinc, and nickel. Bernhardt<sup>10</sup> publishes four cases of grave and inveterate hysteria, in three of which the symptoms were ameliorated and the fourth was healed. Corivean<sup>11</sup> gives the case of a girl with anæsthesia and muscular paralysis cured in four days by gold used externally and internally. Aigre<sup>12</sup> in his thesis mentions several cases.

<sup>1</sup> Étude expérimental sur la metalloscopie et de metallo-thérapie du Dr. Burq. Premier et second rapports.

<sup>2</sup> *Ann. de phys. et de chimie*, t. xii, an. 1823; quoted in *Lyon méd.*, 1880, xxxiv. La metallo-thérapie en 1820.

<sup>3</sup> *Gaz. des hôp.*, 1878. *Compte rend. d. soc. d. biol.*, 1878.

<sup>4</sup> *Gaz. méd.*, 1878.

<sup>5</sup> *Le Prog. méd.*, Jan., 1880, p. 86.

<sup>6</sup> *Compt rend. d. soc. d. biol.*, 1879.

<sup>7</sup> *Lyon méd.*, Jan. 11, 1880, t. xxxiii, and juil 4, 1880, t. xxxiv.

<sup>8</sup> *Berl. klin. Wochensc.*, 29 Jul., 1878.

<sup>9</sup> *Wien. med. Presse*, Jan., 1879.

<sup>10</sup> *Berl. klin. Wochensc.*, 1878, p. 129.

<sup>11</sup> *Mém et bul. de la soc. de méd et de chim. de Bordeaux*, 1878, p. 138, quoted by Petit in *Bul. gén. de therap.*, 1880.

<sup>12</sup> Aigre: *Thèse de Paris*, 1879, quoted by Petit.

Bouchut<sup>1</sup> had a case of hemi-anæsthesia in a girl subject to epilepsy, cured by gold and bromide of potassium.

Besides the cases of anæsthesia of cerebral origin reported by Charcot, Landolt and Oulmont speak of cases where there has been a return of sensibility in hemi-anæsthesia of cerebral origin by application of gold. General and special sensibility returned and persisted three months, with a diminution of chorea which was present.

Examples are not wanting where anæsthesia of the special senses has disappeared upon the use of metallo-therapy. In a number of the cases already mentioned the special as well as the general sensibility was involved and yielded alike to the treatment.

Feuzal<sup>2</sup> describes a case of general anæsthesia, amblyopia, dyschromatopsy, treated for three months with chloride of gold internally, and bracelets of gold on right forearm, and pieces of gold on her forehead. She was made sleepy by them. Dujardin Beaumetz and Ch. Abadie<sup>3</sup> have published a case of blindness improved by gold and cured by static electricity. Charcot<sup>4</sup> mentions instances of achromatopsy with lesions of posterior portion of the internal capsule, as well as hysterical, cured by metallo-therapy. In one of my cases, which will presently be reported in detail, the hearing was restored; and I cite the following observation of the effect of zinc upon the taste, since few cases are recorded, and also as illustrating the rapidity of the action of the metals and the result, as determined by the æsthesiometer eliminating expectant attention and imagination.

OBS. 1.—Patient was a young man, express-driver, under treatment at Throat Department of Manhattan Eye and Ear Hos-

<sup>1</sup>*Gas. des hôp.*, Apr. 18, 1878.

<sup>2</sup>*Prog. méd.*, janv. 4, 1879, p. 3.

<sup>3</sup>*Prog. méd.*, juil. 12, 1879.

<sup>4</sup>*La France méd.*, April 17, 1878.

pital for subacute laryngitis ; complained of dysphagia, sense of oppression in his chest ; felt as if he could not breathe. Said he could not taste any thing. When tested, could not tell the difference between common salt and sulphate of quinine. Anæsthesia bilateral. Could distinguish between one and two points of æsthesiometer in a hesitating manner at  $2\frac{1}{2}$  cm. Applied zinc disk, fifteen minutes after which æsthesiometer showed that he could tell points at 5 mm., which he did accurately and with increasing readiness. Could taste salt but not quinine. Patient lost sight of after this experiment.

The effects of metallo-therapy in anæsthesia have been so carefully investigated and so fully recorded that I have not turned my attention especially to that branch of the subject, but rather to the hyperæsthesias. Nevertheless, two cases in which I have used the metals so well illustrate some of the peculiar points of metallo-therapy, that perhaps they should be given.

OBS. 2.—Patient, a young lady at the New York Infirmary for Women and Children, suffering from antelexion, endometritis with dysmenorrhœa and metrorrhagia. One night she complained of numbness and lack of sensation in left hand and arm, extending to the shoulder. She attributed the trouble to holding a heavy book which she had been reading. Æsthesiometer showed sensibility in hands alike and normal. At the inner aspect of left forearm distinguished points only at 4 cm. In the corresponding portion of the other arm at  $2\frac{1}{2}$  cm. Pin-prick in this zone down to the muscular layer gave no pain and drew no blood. Placed over the anæsthetic portion nine copper disks. In twenty minutes removed them when sensibility was found to be the same— $2\frac{1}{2}$  cm. in both arms. It gave her so much pain that I could not prick deep enough to see if the blood would flow.

Still complained of numb feeling in the hand. Tested again with æsthesiometer, and ring finger showed less sensibility than before. Disks placed around hand and removed after fifteen minutes, when sensibility was restored and numb feeling had passed away.

The disks were left with the patient, who said next morning that the numb feeling returned once or twice in the night ; when she put on the disks it passed away. She said that she had had a

sharp pain down her shoulder and arm, which had also disappeared with the use of the disks.

The trouble did not entirely subside until the third day, during which time she had used, at intervals, zinc and copper disks. "I wish to tell you something very strange," she said; "when I wore copper disks I had such a burning sensation under them; but the zinc disks felt entirely different,—they felt cool. When I had the pain in my shoulder to-day, zinc did not relieve it as soon as the copper, but made the pain different; the sharp pain became a dull ache." Iron had also an effect on this patient, but the results were not produced as quickly as by copper or zinc. These metals have also with her an hypnotic effect.

OBS. 3.—Dispensary patient; a young Jewess; sewing girl. Case was diagnosticated as one of purely hysterical anæsthesia. Her trouble came on in February, 1882, at which time she thought she must have taken cold. Menstruation regular and normal. There was nothing pointing to uterine or ovarian trouble. No examination was made.

She was, at the time of the beginning of her attack, anæsthetic over the right half of the body; but she had received, up to May, 1883, when she came to me, faradism, three times a week, including the faradic brush, under which treatment the anæsthesia had disappeared from the lower extremity. At this time (May 24th) her general condition was good. She complained of a numb feeling in the fingers of her right hand, which made it difficult for her to hold or pick up a needle. Her right arm gave her a sense of weight and heaviness. It was difficult for her to raise it to her head, and especially difficult for her to comb her hair. Her hair was somewhat thinner and 3 to 4 cm. shorter on the right side than the left.

*Examination:* She could feel a touch, but could not readily distinguish the points of the æsthesiometer in some parts of the hand and arm, and not at all in a zone in the neck, extending from the ear down the integument covering the sterno-cleido-mastoid muscle and the upper portion of the trapezius. Taste, smell, and sight were normal, but her hearing was impaired in both ears. Hearing distance—right ear,  $\frac{1}{2}$  ft.; left ear,  $\frac{3}{4}$  ft. Tuning fork showed aerial conduction better in both.

While the tactile sensibility was normal in both hands and both arms, the skin on left side could be pierced to any depth without pain; she had only the sensation of having been touched. No flow of blood followed the pin-pricks.

She wore nine zinc disks fifteen minutes, after which there was a return of sensibility to pain in hand, and flow of blood at the points pricked with a pin. Hearing also improved : left ear,  $\frac{1}{4}$  ; right ear,  $\frac{1}{4}$ .

May 27th.—Sensibility better than before the use of disks on the previous occasion. Tried five disks instead of nine, with no result except in hearing, which was very slightly improved.

May 31st.—Put on nine zinc disks for twenty minutes ; no marked improvement in areas of analgesia, though the latter was not as marked as on the examination May 24th.

Hearing distance—right ear,  $\frac{1}{4}$  ; left ear,  $\frac{1}{4}$ . Slight increase after wearing the disks.

June 5th.—Gave her copper disks, which she wore for the last three days constantly. She complained of burning sensation in her arm, which continued night and day. Sensibility in back of hand greatly increased. Could not stick pin in to draw blood without great pain, and blood flowed after pin-prick. The zone in neck, in which she had not been able to tell points, even at wide distance, showed an improvement. She could tell points at 5 cm.

June 11th.—Patient had not worn disks. Hearing—left side,  $\frac{1}{4}$  ; right,  $\frac{1}{4}$ . Sensibility in zone in neck  $3\frac{1}{2}$  cm.

Said arm felt much less heavy. Complained of numb sensation in fingers, especially of index finger of right hand. Æsthesiometer showed sensibility much the same in both hands ; little less in tips of right than of left. No flow of blood when pricked.

After copper twenty minutes : Sensibility of neck not increased, rather diminished ; hearing remarkably improved.

June 14th.—Said she felt much better. Arm less heavy ; less burning feeling at night, of which she had complained. Still fingers very numb ; could not tell if she had a needle in her hand if she did not see it. She could comb her hair more easily than ever before since she had been sick, for she could raise her arm more easily to her head.

She could tell points at  $3\frac{1}{2}$  cm. on right side when the pressure was hard ; except in one zone over the middle third of the sterno-cleido-mastoid muscle ; while she could feel a touch she could not feel a pin, and when it was thrust in deeply no blood followed it.

After copper thirty-five minutes : Pin-pricks in analgesic spots were painful ; blood followed ; could tell points with less pres-

sure. Sensibility was at 3 cm., while on left side at  $2\frac{1}{2}$  cm. There was more sensibility to pain in fingers.

June 30th.—Had not been to see me for sixteen days, during which she had had no treatment. Hearing in right ear,  $\frac{3}{8}$ ; left,  $\frac{1}{8}$ . Hand and arm same as before; perceived points at the same distance on right as on left, except third finger more insensible than others,—required more pressure. Zone in neck almost as analgesic as ever; nevertheless, could tell once in a while at long distances 5 and 6 cm., if there were two points.

After copper, thirty minutes: Hearing  $\frac{1}{8}$  on both sides, first time since I had examined her. Sensibility increased in right hand so that she could feel the slightest touch. Tested while the disks were still on. She had a sensation of two points, and answered "two" wherever touched, whether one or two points of æsthesiometer were used. Bracelet of nine disks were then placed around the wrist. After ten minutes removed them all, when there was normal sensibility, increased appreciation of pin-pricks, and she could tell accurately and quickly as in left hand, notably in third finger which was less sensitive before.

July 3d.—Hearing in right ear  $\frac{3}{8}$  to  $\frac{1}{8}$  in left. Sensibility in fingers remained improved, though not the same as when disks were removed. Said her arm was much lighter. Put copper disks over zone in neck and zinc around her arm, which were to be left on until she came again.

July 5th.—Wore disks until the afternoon of July 4th, when they burned so much she was obliged to take them off for two hours. Arm felt heavy. She felt burning more under the zinc disks than under the copper ones (the reverse of the preceding case). Under the copper a papillary eruption was to be seen, with points here and there which had bled. Over anæsthetic zone in neck could tell points at 5 cm. surely, and was generally right at  $3\frac{1}{2}$  cm. On left side in the corresponding region could tell them at  $2\frac{1}{2}$  cm. Sensibility about the same in both hands. Hearing in both ears the same and normal.

Patient said she could tell now when she held a needle in her right hand, which she had not been able to do since she was sick, and could distinguish one object from another by touch, which she could sometimes do after having received faradism. Then, however, the power only remained a part of the day, but since she has used disks it has been permanent.

July 7th.—Patient wore copper disks five hours on July 6th,

and five hours this morning. Could tell points of æsthesiometer in zone of neck  $2\frac{1}{2}$  cm. if pressure was great. Said her hand burned when the disks were worn on arm or shoulder. Complained more of index finger, which felt the prick less than others.

July 18th.—Patient said she felt very much better than she had since she was sick. Gave her sulphate of zinc .12, to be taken three times a day. Took off the metals.

July 21st.—In zone in neck with more pressure tells the points as on the other side at  $2\frac{1}{2}$  cm. Face, arms, and hands normal. Hearing alike on both sides, which has been the case since July 5th.

Patient was lost sight of on account of my absence from the city during the remainder of the summer, and I have not seen her since, so that I cannot tell if this return very nearly to normal sensibility was permanent or not. The first patient I have seen now four months since the time of the attack of anæsthesia, and she has had no return of it. There was no transfer in either of these cases.

Cases where there is loss of motility of varying degree, from muscular weakness up to the more serious manifestation of paralysis, have been favorably affected by the use of metallo-therapy. This has been shown in many of the cases already mentioned. Petit<sup>1</sup> quotes cases of paraplegia and hemiplegia of toxic origin, which have been benefited by metals, two of which were cases of lead paralysis.

A case of hysterical anuria has been reported<sup>2</sup> cured by the application of Dr. Burq's armatures over the vesical region. Gold was not successful, but several of the other metals were. I have used them in a case of hysterio-epilepsy in a girl of fifteen, who said that sometimes a week would go by without her being able to pass her urine, when she would suffer greatly and go to hospitals and have the catheter used. When she came to me, according to her story, two

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<sup>1</sup> *Bul. gén. de thérap. Loc. cit.*

<sup>2</sup> *Brit. Med. Jour.*, April, 1879.

or three days would intervene in which she was unable to evacuate the bladder. She was treated with copper, zinc, and iron disks over the spine and vesical region, and gradually she has come to urinate normally.

I have used the disks a number of times where catheterization was necessary after operations and after labor, but never with the slightest success.

In the hyperneuroses, metallo-therapy, though used to a much less extent, has proved successful. Hysterical<sup>1</sup> and other contractures,<sup>2</sup> chorea, writer's cramp,<sup>3</sup> neuralgia,<sup>4</sup> angina pectoris,<sup>5</sup> and clonic<sup>6</sup> as well as tonic spasms have yielded to metals. In the case of rhythmical myoclonus, which I reported at length in a recent number of these ARCHIVES,<sup>7</sup> the efficacy and peculiar effects of different metals were shown, as well as the difficulty of accounting for these on the hypothesis of "expectant attention."

OBS. 3.—In a child of eleven the supinator longus muscle of the right arm and certain of the inner hamstring muscles of both lower extremities contracted regularly and rhythmically before the use of disks of plated gold. After wearing them fifteen minutes, they fell from sixty to fifteen contractions per minute. They were also changed in character—from regular and rhythmical to irregular and tetanoid. Once, after keeping the disks on all night, the contractions became very few, feeble, and irregular.

Copper reduced them from forty to eight per minute. They remained clonic, but were distributed into groups of one, twos, and threes. Zinc reduced them from thirty to three per minute, and they remained clonic. Silver was tried with no result. The effect of the metals was not lasting.

After a few hours the contractions increased and in several days were as numerous as ever.

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<sup>1</sup> *Gas. des hôp.*, Apr. 18, 1878.—M. Bouchut.

*Gas. des hôp.*, 1882, p. 764.—Chantemeisse.

<sup>2</sup> *Gas. des hôp.*, 1881, p. 460.

<sup>3</sup> Les surprises et les étonnements de la metallo-thérapie.—Burq, *Gas. des hôp.*, 1882.

<sup>4</sup> De la chorée rythmique.—Charcot. *Prog. méd.*, Feb., 1878.

<sup>5</sup> *Gas. des hôp.*, Sept. 2, 1879, p. 808.

<sup>7</sup> ARCHIVES OF MEDICINE, April, 1883.

The use of metals in spinal hyperæsthesias was suggested to me by the following case. I had not seen the treatment recommended, and had made most of my observations before chancing upon a short article by Benedict<sup>1</sup> in the *Wiener Presse*, in which he reports good effects of zinc disks placed along the length of the spine in hysterical spinal irritation.

OBS. 4.—H. C., admitted to N. Y. Infirmary for Women and Children September 4, 1882. Patient was unmarried; age twenty-five. Diagnosis: hysteria, endometritis, and retroversion. Uterine condition improved under treatment, and the uterus returned to its normal position, but the severe back-ache of which she complained when she came resisted every thing. Dry cups, actual cautery, ice to the spine, galvanism, were tried one after another. There was great tenderness over the spine, varying in region from time to time. The slightest touch made her jump. I had the metals, to try them in the case of clonic spasms just spoken of, when without having any faith in their efficacy, and having little idea as to how they should be used, I placed them, zinc, copper, silver, and gold, over her upper dorsal and the cervical region, the places where there was the most pain. Very soon she complained of experiencing a peculiar, indescribable sensation, and that the pain had left the place under the disks and was felt in the sacral and pelvic regions. The metals were moved to the site of pain, when she soon after complained of a queer feeling in the top of her head. The metals were placed there, and remained during the rest of the application, fifteen minutes. The next morning she said that she turned in her bed, the first time since August (two months), without pain. The whole appearance of her face was changed. Instead of dark circles under her eyes, and a face expressive of weariness and lassitude, her cheeks were red and her eyes bright. There were a vivacity and a hopefulness about her quite unlike any thing she had shown since she came into the hospital. She attributed the whole change to the metals, which she said had had a magic effect. I gave the credit of the magic effect to her imagination. At noon I tested the sensibility of her hands with the æsthesiometer, and found that she could not distinguish between one and two points at 5 cm., not even on the palmar surface of the fingers. I wrapped copper disks around

<sup>1</sup> *Wiener Presse*, 26 Jan., 1879, No. 4.

one hand and zinc disks around the other. After leaving them fifteen minutes I tested, to find that she had normal sensation in both hands, and could tell accurately whether one or two points were used without making a mistake or hesitating. She said she felt very much better after this application, and left the hospital the next day, announcing that she was cured by the disks. This was in November. I saw her from time to time during the winter, but she had had no return of the distressing spinal symptoms.

In June she had a recurrence of her uterine trouble, and a suggestion of the old pain in her back. Examination showed tenderness over the spines of the vertebræ in lumbar region. A string of a dozen plated gold disks was applied, and during the twenty minutes they remained on she described her sensations, a record of which I had kept, in exactly the same words as when she had tried them in November,—the queer, indescribable sensation and the shifting of the pain. After the disks were removed the sensitiveness disappeared. I could press upon the vertebræ without any sign of pain. Before using the disks I tested the sensibility with the æsthesiometer. She distinguished points at 5 cm. ; after the discs, at  $2\frac{1}{2}$  cm.

OBS. 5.—Case of hystero-epilepsy in a girl of fifteen, already alluded to as a case of anuria, in which zinc and copper disks had a marked effect. She was one of the most hyperæsthetic persons I ever saw. The least touch of the finger, especially in the lumbar region and over the hypogastrium, would cause her to draw away in a kind of spasm. She first wore copper, which had the effect of making her pass her urine regularly. The urine was normal in color, acid, Sp. gr. 1014, and contained no albumen. She improved constantly after wearing a chain of nine zinc disks. She could be touched anywhere without shrinking, and could bear any amount of pressure over the vertebræ and hypogastrium. Her color improved, and she could stand straight. When she came she was much bent over and was a most forlorn-looking object. After this she received a great fright and came back in as bad a nervous condition as ever, except that she passed her urine regularly. The hyperæsthesia again subsided under the use of tin, and also after iron. Wretched surroundings, poor food, insufficient clothing, and a mother who beats her make it doubtful if she would receive lasting benefit from any treatment.

OBS. 6.—Private patient, A. N., young lady, single ; complained of great pain over the upper dorsal, cervical, and occipital

regions. Spines of vertebræ exceedingly tender. Could not bear the slightest touch. Could not lean back against a chair.

Had used actual cautery, ice, constant and interrupted current, without any permanent benefit.

March 23d.—Applied nine zinc disks ; pain greatly increased.

March 24th.—In the morning a feeling of tenseness, stiffness, and pain, which disappeared after moving about. Was surprised to find herself leaning back in a chair without being conscious of her spine. Disks removed upon retiring.

March 25th.—Pain in lumbar and dorsal regions, but of a much less degree and occurring at intervals. Disks removed at night.

March 26th.—No pain.

Disks were worn a week during the daytime, after which they were left off. Pain has not returned up to the present time—more than six months.

The following cases, which were relieved by the metals, and a number more which I will not take the space to report because of their similarity, did not have marked hyperæsthesia as a symptom, but persistent pain in the back was present, sometimes as the only trouble, at other times accompanied by some disease, mostly uterine.

OBS. 7.—H. L., lady, single, twenty-five years old, patient in private practice. Two years before had operation for congenital retroversion ; the uterus was bound down. Since then has had feeling of pain and dragging sensation in lumbar and sacral regions. Had received spinal douche, general faradization, and massage without improvement. Patient was anæmic and easily exhausted. Put on a chain of plated gold disks, which she wore constantly for two weeks. During that time she greatly improved. Was able to walk without sense of fatigue, and to wear heavy clothing. Had not been so free from back-ache for two years.

OBS. 8.—Dispensary patient ; young woman, age twenty-six ; married. Diagnosis : antelexion. Complained continually of pain in her back and left leg, which was not relieved when the uterus had been replaced. Wore nine zinc disks. The first week pain was much better ; the second week pain passed away entirely. She was able to do her house-work, and to stand at the ironing-table and do her ironing, usually her hardest task, because of the pain. The trouble had not returned when last seen, ten months from the time she had used the zinc.

OBS. 9.—Dispensary patient. Young woman ; single. Diagnosis : anteflexion and endometritis. Had been coming to the uterine clinic for a long time. Always complained of great and peculiar pain in the lumbar region. One day gave her the copper disks. It was three weeks before she came again, when, in answer to inquiries, she said her back had been entirely cured. She used the disks three times on three successive evenings, and each time, after wearing them fifteen minutes, the pain passed away. It did not return after the third application. She has other aches and pains, and her uterine trouble persists ; but she always says that the old unbearable pain never has returned in her back.

In these cases which have been given, there was very little opportunity for experimentation. The metals gave effects so speedy and so marked that there was no room to doubt that the result was due to their use.

Aside from the therapeutical aspect, two points suggest themselves :

First :—The wide disparity between what was accomplished and the means, making of striking significance the remark of an experimenter who has said the *æsthésio-gènes* were not comparable physically, but physiologically. Galvanism and faradism had been tried in so many instances and failed, when metals were successful, and that most powerful excitant, the faradic brush, had been used in one case of anæsthesia which I have cited, and in a number reported by Westphal :

Second :—The fact that weak currents have restored sensibility where strong ones have been unavailing. If the result of the metals is not due to electricity, may not their effects be explained and come under the formula of Regnard, in a figurative if not a literal sense, who says that : “In the galvanometric scale there are certain points constant in each individual case, at which sensation is recalled (or restored to normal) by the action of the current, whereas this does not occur when the current is either weaker or stronger, however long applied.”

Burq<sup>1</sup> says that the metals are good in psychical disturbance, and brings forward to prove it a case of a woman in a raving delirium brought to her senses by the application of silver. He adds, that in patients at Salpêtrière who committed all sorts of eccentricities, when metals were used that sort of moral anæsthesia disappeared like the physical anæsthesia. They became docile and affectionate, and conscious of their duties.

Three cases are on record in which ill effects were produced by the metals. Dumontpallier<sup>2</sup> tells of a case of hysteria not yet pronounced, which was determined by the application of copper; gold, iron, and silver having been tried without result.

Aigre<sup>3</sup> reports a case of insensibility occurring under plaques of gold applied for two hours to forearm; silver obtained nothing. Sensibility returned little by little at the end of four hours. Vergeley<sup>4</sup> gives a case of hysteria in which, after the use of copper and iron, sciatica was the result. Gold had no effect.

#### *Methods of Using the Metals.*

"The use of metallo-therapy" says Vigoureaux, "is not an easy thing; it exacts on the part of a physician great practice. This is certainly one of the reasons why the methods of Dr. Burq have so much difficulty in becoming popularized." Another reason might be alleged, that definite methods for the application of it have not been laid down, and the physician is left to his own devices and to his own experimentation to work out a practical system.

Briquet brings as a reproach, not without foundation, that metallo-therapy has been practised for some time in a

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<sup>1</sup> *Gas. des hôp.*, Nov., 1882.

<sup>2</sup> *Brit. Med. Journ.*, Oct., 1878.

<sup>3</sup> *Thèse de Paris*, 1879.

<sup>4</sup> Quoted by Petit: *Bul. gén de therap.*, loc. cit.

vague and spasmodic manner. I have failed to find any comprehensive directions which one could follow. This is the excuse for the lack of method in the application of metals, which is apparent in the report of cases which I have given.

There are three methods used in metallo-therapy: 1. The external. 2. The internal. 3. A combination of external and internal.

Metalloscopy is the first thing to be taken into consideration. By this word is meant the selection of the metal or metals adapted to the individual. One must recognize the peculiar fact in connection with the use of metals—that of personal idiosyncrasy. It is what Burq calls the “personal sensibility” to metals. He believes and advances the fanciful idea that there is a direct relation between the diffusion and abundance of metals in nature and their application; consequently he gives this order in which to try the metals, as also does Charcot,<sup>1</sup> iron, zinc, copper, gold, silver, tin, and platinum. Vigoureaux<sup>2</sup> says that in one hundred, seventy are affected by iron, while thirty are by the remaining metals. Garel<sup>3</sup> finds gold to act more frequently than iron, and places copper next. He met one patient who responded to lead and to no other metal. Certainly from the reports of cases where metallo-therapy has been successful in hysteria, one is inclined to agree with him, and also with Despine, who placed gold at the head of the list.

Persons are sensitive to more than one metal. Where polymetallism, as it is called, exists, it often occurs that no one metal will give complete results. For instance, zinc may affect the vascularity of the skin and the temperature, but not increase the muscular force. It is also stated<sup>4</sup> that

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<sup>1</sup> De la metalloscopie et la metallo-thérapie.—*Gas des hôp*, mars 7, 1878.

<sup>2</sup> Metalloscopie, metallo-thérapie œsthésiogènes.—*Arch. de Neurol.*, 1880, *loc. cit.*

<sup>3</sup> *Lyon méd.*, 1880.

<sup>4</sup> *Prog. méd.*, juil. 27, 1878.

the effects of metals, as well as that of magnets and electricity, can be prolonged at will by using a neutral metal, which will generally be found to be among those which rarely produce results. It can be placed over the metal or point of appreciation, or anywhere between it and the central nervous system.

If a metal, after a week's trial, has produced no effect, says Du Montpallier,<sup>1</sup> it is useless for that case, and must be exchanged for another. In making the experiment it is better to wait two or three days before trying another. This may be the proper way of thoroughly testing the matter; but my experience has been, if there are to be effects, there is usually some evidence of it in half an hour.

The form in which metals have been used externally have been disks or plaques. Dr. Burq's armatures, of which one reads so much, are composed of round pieces of metal three cm. in diameter, made with a slide upon the back so that they can be strung on a ribbon. Those which I have used in the cases reported are  $3\frac{1}{2}$  cm. long and 3 cm. wide. The shape can make no difference.

Some authors, especially those who hold the chemical theory, direct that the metals used should be of the purest. That they should be perfectly smooth, especially upon the edges, that they may not abrade the surface of the skin, is apparent. In some of the cases reported it will be seen that plated disks were used. If the metal were plated on an inactive or neutral one, it would be supposed that there would be no result; if there were effects, it was because the person wearing them was susceptible to both metals. If, however, as was the case in those used, they were plated on both sides, then the result, according to Vigoureaux, ought to be the same as if a simple metal were used; since, if the gold were plated on copper, it were the same as if two

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<sup>1</sup> *Gas. d. hôp.*, juil., 1879, and *Brit. Med. Jour.*, Nov., 1879.

gold pieces were used with copper between, and, according to the law of tensions already quoted, the result would be the effect of the extremes of the series, or of the skin and the last piece of gold.

After testing the sensibility, Dr. Burq's plan was to drape different parts of the body every day with metals. He continues his applications daily for fifteen weeks, when the patient is better. After a time if the trouble reappears, the treatment is resumed. Charcot places his metals upon the forearm.

The number of disks or the amount of metal makes a difference, as one would suppose, in the result. In the experiments referred to by the Société de Biologie sometimes only a single piece of metal or a coin was used. In Obs. 3, I used once five disks with only a very little result, whereas with nine both hearing and anæsthesia were improved. I have seldom used more than from nine to twelve. If any results at all were to be had they were to be had with that amount.

Sometimes Burq uses a very large number, "draping his patients," as some one has described it, "as if with mail."

The time requisite to obtain effects varies, according to Vigoureaux,<sup>1</sup> from thirty seconds to twelve hours. At Salpêtrière they were rarely used more than an hour.

When used for purely therapeutical use and not for experimentation, it is not necessary to limit the time. In the cases of spinal irritation which I have reported, the directions given have been to wear them until the pain and tenderness subsided and then to take them off and not put them on again until there was a return of the symptoms. The metals, in many instances, lose their effect if worn continuously, and if there is an increase of the original trouble the

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<sup>1</sup> *Arch. de Neurol.*, 1881, *loc. cit.*

same metal is not as serviceable as before. The maximum effects are obtained in the short time mentioned above, and while no change may occur from continuing to wear them, it is seldom that an increase of results is obtained.

Burq regarded the external use of metals as simply a stepping-stone to the internal use. The internal therapeutic action, he claims, always corresponds to the external, and the latter should be employed to determine the personal idiosyncrasy. The metals have been administered internally in the form of powders, finely minced metallic leaves, and in the various salts. It matters little which form of the salt is employed. It is given hypodermically when the stomach is disturbed. Lead, as might be surmised, is not in the metal pharmacy. Sometimes mineral waters, when they are known to contain a certain per cent. of the metal desired, are used. The connection of the beneficial effects of mineral waters with metallo-therapy has been suggested.

#### *Effects of Metals.*

If the metal used is not the one adapted to what Burq calls the "metallic sensibility" of the person there will be no effect whatever; if, however, it is, the sensation most commonly experienced is that of warmth, from a very slight degree to that of an almost intolerable burning. One patient who wore the disks for pain over the spine said that they felt warm and comfortable; that before she had always a chilly creeping sensation, from which it was delightful to be free.

After removal of the disks the skin beneath is often red, varying in degree from a slight erythematous blush to a deep color. In some, small vesicles have appeared. It may be thought that the redness is only such as would result from the presence of any foreign body, and would occur in any case. This is not so, since one kind of disks

may occasion it when another will not. Once or twice the patients have complained of the disks feeling uncomfortably cold, even though they had been on for hours, when one would have supposed that they would be of the body temperature.

Great perspiration occurs sometimes beneath the disks.

Prickling sensation, heaviness, and great sleepiness are often spoken of. The last is so common an effect as to suggest the use of the metals as an hypnotic. In several instances they have proved very effectual as such. In one case silver disks were employed with success where opium had been taken previous nights without result.

There is an increase of muscular strength as measured by the dynamometer; an increase of temperature of the surface of the skin to which the metals have been applied; a return of general sensibility where there have been anæsthesia and analgesia; also a return where there has been loss of special sensibility: in both instances there may or may not be a transfer of sensibility from the unaffected side to the other, of just so much as it has gained.

In achromatopsy it has been found that the colors follow a regular order in the return of power to distinguish them, and that in the inverse order in which the power was lost,<sup>1</sup> which is violet, green, red, yellow, and blue.

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<sup>1</sup> De la metalloscopie et de la metallo-thérapie.—Charcot : *loc. cit.*

## UPON TRANSFERRED PATELLAR TENDON-REFLEX.

By ALLAN McLANE HAMILTON, M.D.

OUR attention is sometimes directed to anomalous cases of disease of the nervous system in which the so-called transfer symptoms exist. In those examples, when associated movements which are so common in various phases of pyramidal degeneration are present, the pathological explanation may lie in a cerebral or spinal commissural arrangement.

In alluding to the existence of reflex excitement in connection with lateral-column disease, Ross and others call attention to certain crossed-reflexes which are evoked when the periosteum or fasciæ are the initial points of shock. In 1873 I pointed out the fact that in irregular posterior spinal sclerosis it was possible by galvanization of the quadriceps of one extremity to produce contraction of the muscle in the other. Since that time various observers have noticed the same phenomenon, and the transfer of reflexes, not only in posterior spinal sclerosis, but in other diseases, has come to be accepted as a clinical fact. The following history is one which demonstrates a much more interesting phase of reflex activity than any I have seen, and I think it proves that in certain cases there is a direct and limited crossing of centripetal impulses in the cord.

L. J., aged 48, is a man of good habits, yet a rather free liver. His family history discloses no nervous disease, and there is no

reason to suspect syphilis. He has led an active life and done much hard work. About four years ago he began to manifest the symptoms of his present malady. He was restless, irritable, and at times melancholic and depressed. He was rather boastful, yet his extravagant talk was not that of dementia paralytica, and had some basis. About this time he found that the right upper extremity was weaker than the left, and that it became agitated by tremor which increased when he attempted some complex act. Subsequently the left upper extremity was affected in the same way, and then the legs in turn became weaker and he was obliged to discontinue his daily horseback exercise and his walks, and only left his house when obliged to do so. He had some pains in the lower extremities, mainly confined to the nerve-trunks, but there was no anæsthesia.

I saw him in April last and he has since been under my care. In appearance he presents the facies of Parkinson's disease, and his eyes have an anxious and sorrowful expression. Facial innervation is weak, and fibrillary twitchings, especially of the muscles about the mouth—the orbicularis and levator anguli oris, are quite decided when he attempts to speak. His tongue is the seat of a coarse tremor, with convulsive retraction of the whole organ when it is protruded. His speech is "scanning" and somewhat explosive at times, and labial and lingual articulation is decidedly at fault. Both optic disks show commencing gray-atrophy, but there are no evidences of paresis of the muscles of the eyeball, and no hemiopia. The right pupil is larger than the left. He sits with head bowed and body curved.

There seems to be a general tremulous condition of the entire frame when at rest, and as well, a marked voluntary tremor. This is increased when he is excited. His walk is unsteady and feeble, his feet are somewhat separated, and he sways to and fro when progressing, and seems to be impelled forward; in fact, there is conspicuous festination. The muscles respond, if any thing, rather too actively to both currents, when directly or indirectly applied, and the electric sensibility seems unaffected. He has a rather active expulsion of urine, but beyond slight constipation his bowels are unaffected. His general physical condition is as good as it could well be. Mentally he is disposed to be boastful regarding his professional career and income. The burden of his conversation is about the value of his jewelry and pictures, the extent of his business, and his elation suggests dis-

ease. He cannot write except with great effort, and his attempts result in "shakiness," and badly formed words.

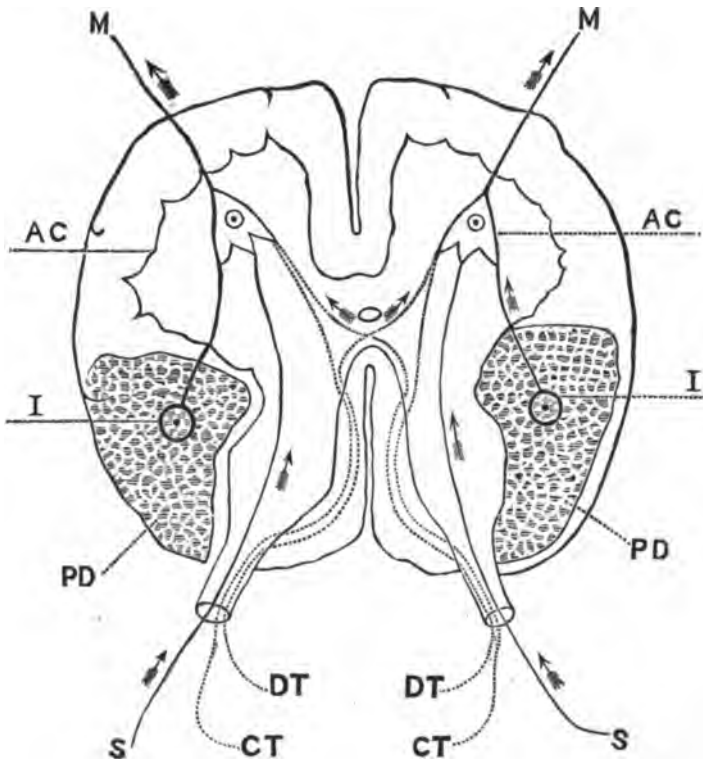
The *reflexes* are all exaggerated on both sides, and the slightest cutaneous or tendinous irritation gives rise to decided motor excitement. When in a constrained position, or when both feet are placed upon a chair, a violent and continued tremor is induced, the ankle-clonus is bilateral and violent, and the Achillar-reflex lifts each heel quite forcibly. The cremasteric, abdominal, and upper reflexes are all pronounced. When his thighs are supported so that both legs hang loosely, a very curious phenomenon is witnessed. I have upon three separate occasions made the test and have evoked a limited crossed-reflex; that is to say, when the right patellar tendon was struck a light blow, the opposite leg would present the jerk, and the left foot would be thrown out. When the left patellar tendon was tapped, the result would be reversed. There would be no jerk upon the side struck, but the muscular action would invariably follow in the other limb. I was at first disposed to look upon this peculiarity as a chance expression, or perhaps an associated contraction, but its constancy, and the fact that the muscles of the excited side did *not* respond, convinced me of the curious and extraordinary nature of the symptom. None of the other reflexes were transferred.

Ross,<sup>1</sup> as I have said, speaks of certain "periosteal" and "fascial" reflexes, and refers to the results he has obtained by tapping the middle of the tibia, and other like sites, when ensuing contraction of the quadriceps upon the same or opposite side, as well as of the adductors, would follow when the legs were extended. Though closely resembling the motor disturbance in my patient, I do not believe these examples come under the head of true transferred reflexes such as are presented in the case of L. J. In him the patellar tendon was stretched and struck fairly with the rubber hammer so that no diffused jarring resulted, as might have occurred had the patient been extended upon a bed. The fact of the uniform crossed-results points to the certainty of a primary localized peripheral irritation of the centripetal conductor, and a secondary stimulation of a motor

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<sup>1</sup> "The Diseases of the Nervous System," vol. 1, p. 153.

centre in the opposite side of the cord. In his case there were no crossed "periosteal" or "fascial" reflexes, and, no true transferred tendinous reflexes in any other part of the body.



AC, AC, cells of anterior horns. M, M, motor conductors. I, I, inhibitory centres. PD, PD, degenerated pyramidal columns. S, S, posterior fibres terminating in skin. DT, DT, direct tendinous fibres. CT, CT, commissural tendinous fibres.

Whether the transfer of the excitation in this case is due to some anomalous anatomical arrangement of the sensory fibres of the cord, or to some unusual location of the lesion, I am unable to say. I believe, however, that other examples may be found when the tests are uniformly made. Heretofore most observers have tested the patellar-reflex by making the patient cross his legs; or one extremity has

been tested at a time. If both legs are suspended, it is possible that transferred reflexes may be detected, more frequently than they now are, and I have had constructed, for the purpose of determining the absence or presence of the patellar tendinous reflex, a small support of T shape, with a firm base, upon which both thighs may be placed. This is a convenient apparatus in many ways, and of great service when the patient happens to be a corpulent person.

It is very probable that more fibres of the external fasciculi of the posterior nerve-roots pass forward and decussate than we have any idea of; or that the internal group of large motor cells receives sensory connecting fibres, which may sometimes be in excess of the direct fibres. Whether L. J. always presented the crossed-reflex in health is not known. It may be assumed, however, that either through disease of the direct centripetal sensory fibres in that part of the cord from which the second, third, and fourth lumbar nerves arise, or an anomalous development of the crossed fibres, the peripheral stimulation is carried across the cord, and as the inhibitory influence coming from both lateral columns is abolished, the motor discharge may proceed from the cells in either anterior horn. The accompanying plate is intended to show the course of the commissural fibres of the external fasciculi and their cell-connections.

## EDITORIAL DEPARTMENT.

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IN the death of Doctor J. Marion-Sims we all have lost a friend of rare professional and gentlemanly qualities. Eulogies are useless when offered in memory of a man so well known, so widely respected, and so universally loved, as he. Sympathy for his family and honor for the departed will be the tribute of two hemispheres.

R. W. A.

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## NEW BOOKS AND INSTRUMENTS.

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**A Practical Treatise on Impotence, Sterility, and Allied Disorders of the Male Sexual Organs.** By SAMUEL W. GROSS, A.M., M.D. 8vo, 176 pp. Henry C. Lea's Son & Co., Philadelphia, 1883.

The former edition of the first work was reviewed in this journal, October, 1881, but, contrary to custom, it is again noticed because of its excellence, and to contrast it with a recent work on a kindred subject.

Impotence is studied under the subdivisions of atonic, psychological, symptomatic, and organic impotence.

Sterility is subdivided into that caused by azoospermism, aspermatism, and misemission, while the book concludes with chapters on spermatorrhœa and prostatorrhœa.

The work throughout bears the marks of extensive reading, a large experience, a truly scientific spirit, and an arrangement of the material at hand in a systematic, book-like way.

After a brief introduction on the mechanism of erection, each ailment is taken up and disposed of in its etiological, clinical, pathological, diagnostic, prognostic, and therapeutic aspects, thus making it in truth a treatise. The separation of these subdivisions into paragraphs, headed by capitals, the abbreviation of cases and their relegation to separate paragraphs and smaller type, and the introduction of sixteen cuts, most of them original, all tend to make the work an instructive text-book.

It is not strange that the book should have a surgical tone when the author has seen *one hundred and fifty-nine* cases of atonic impotence due to inflammation or hyperæsthesia of the prostatic portion of the urethra, and only *twelve* due to diminished or abolished reflex excitability of the prostatic portion of the urethra.<sup>1</sup>

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<sup>1</sup> Page 21.

Psychical impotence must needs be rare when a man of Professor Gross' experience has seen but one case, which he narrates.<sup>1</sup>

From researches first published in 1877,<sup>2</sup> and from his subsequent experience, he concludes (and he backs up his conclusions with records of careful urethral examinations) that impotence is very often due to morbid sensibility and subacute inflammation of the prostatic urethra often associated with stricture. He affirms that stricture and gleet are often caused by masturbation, and cites five cases, in which the idea of an antecedent gonorrhœa must be discarded, to substantiate his affirmation. In Professor Gross' one hundred and fifty-nine cases of atonic impotence, one hundred and forty were examples of feeble erection and premature ejaculation, fourteen had lost the power of erection but retained the desire, and five had lost both power and desire. The author's line of treatment is moral, hygienic, surgical, medicinal, and in every way sensible, occupying seventeen pages of the book ; it will be referred to later.

Of psychical impotence he says little, having seen but one case himself. He calls attention to many cases which would be thought to be psychical impotence did not a careful examination reveal a sensitive urethra. He says :<sup>3</sup> "I have dwelt somewhat at length upon the erroneous diagnosis which is usually made in cases of so-called psychical or nervous impotence, in order that I might call attention prominently to the importance of examining the urethra in all examples of impotence, since the prognosis is far more favorable when the trouble depends upon hyperæsthesia of its prostatic portion, than when that condition is absent. Had this precaution been observed by many writers on the subject, they would have been able to give a less gloomy account of psychical impotence, and have said less of the importance of gaining the patient's confidence, and of the moral treatment adapted to each case."

Section V. contains a discussion of organic impotence, from abnormal conditions of the penis and testes. A very terse but full presentation of the subject.

The remaining subjects—sterility, spermatorrhœa, and prostaticorrhœa—are handled in the same methodical, scientific way, but as they bear little upon the subject in hand,—impotence,—no further notice of them will be taken.

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<sup>1</sup> Page 61.

<sup>2</sup> *Med. and Surg. Reporter*, May 5, 1877, p. 391.

<sup>3</sup> Page 63.

Professor Gross' book is, as its name indicates, a treatise, concise, systematic, scientific, and sensible. It is a book for physicians and students only, and holds out no temptations to others than one in want of a plain scientific exposition of pathological therapeutical data. To the seeker after prurient literature the book is a poor investment, for the cases reported are few, shorn of their disgusting details, and couched in the plainest and most *un-sensational* language.

Professor Gross is, without any doubt, actuated by the same manly feeling as his fellow-townsmen, Goodell, when he said to his clinical class, on approaching the subject of masturbation in the female: "For the correct interpretation of diseases we must intrepidly search out their causes, whether moral or physical, however loathsome or impure they may be. . . . It is, however, so hard a task to discuss such subjects in acceptable language, that I confess to some squeamishness, and would much rather refer you to suitable text-books, were there any. But, unfortunately, there are none on these subjects, although our land is flooded with a prurient literature treating of the conjugal relations. Impudent quacks and men of battered reputations must not be your guides, far better it is for you to learn a new thrust of fence from a friendly foil than from the stab of a foe."<sup>1</sup> [R. W. A.]

**Sexual Impotence in the Male.** By WILLIAM A. HAMMOND, M.D., Surgeon-General U. S. Army (retired list); Professor of Diseases of the Mind and Nervous System in the New York Post-Graduate School; President of the American Neurological Association, etc., etc.

It was my intention to review this book, but, as a careful perusal proved it nearly as barren of valuable scientific material as a summer novel, I desist.

Two thirds of its pages are given up to the almost uninterrupted introduction of cases, many of them narrated with an astonishingly unnecessary minuteness of disgusting detail.

[R. W. A.]

**Insanity Considered in its Medico-Legal Relations.** By T. R. BUCKHAM, A.M., M.D. Pp. 265. J. B. Lippincott, Philadelphia, 1883.

Dr. Buckham's book is intended for the reformation of legal medicine, and we are told in the preface that it is the author's

<sup>1</sup> "Clinical Lessons in Gynecology" (see *Am. Jr. Obstetrics*, etc., etc., May, 1883, p. 450).

aim to advance the so-called "physical media" theory of insanity. He, however, treats his subject in no new way, and there is little to be found that is not contained in any of the various standard works upon forensic medicine. In many respects the volume reads like one of the essays which emanate from either of the local societies of medical jurisprudence, and it would have been of far greater value had the author followed more closely the teachings of modern psychiatry. Notwithstanding its conventionality, it presents much that is attractive, and there is a vein of rigorous criticism which must meet with the approval of all who have occasion to go into court. Dr. Buckham calls attention to the crude legal tests of insanity by which real disease is so often overlooked, and to the stupidity of courts of law who consider the mind as something that may be collected in a bell glass and analyzed at leisure. He very carefully points out the errors in the various rulings which are so often quoted, the insufficiency of the venerable "right and wrong" test, and brings forward many pertinent cases to support his views.

His chapter upon experts is quite full of suggestions, some valuable, and others quite impracticable. He has an all-abounding faith in the acquirements of the superintendents of asylums, and is disposed to believe that outside alienists do not make good experts. There is some truth in this, but every day brings the conviction that insanity is being studied outside of asylums in a more thorough way than it ever has been before, and there is a large body of energetic men who are delving into the neglected fields of cerebral pathology, and doing much which must place them ultimately upon the same, if not a higher plane, than that at present held by most of the medical officers of asylums.

Dr. Buckham dwells upon the shortcoming of the expert system, and we entirely agree with him when he says that the courts are disposed to listen with the same attention to the testimony of the non-expert and that of the man of experience. In New York at least, and it is doubtless so elsewhere, any medical nomad may go upon the witness-stand and claim to be an expert. In one court his expertism lies in the direction of broken legs, in another it is "spinal concussion," in a third it is "gynecology," and again it is insanity. Judges are too apt to cast contumely upon expert testimony as a whole, because educated men and impostors are pitted against each other. His suggestion for the institution of a commission would do away with much injustice if such a one

were appointed and its duties properly defined. According to Buckham the expert should give his services without expectation of reward, and be prepared to hold himself in readiness to be called to any part of the State in which he lives. We know of no fully qualified medical gentlemen outside of the asylums, who would give up their practice and go upon such a quixotic errand. Even those alienists in charge of institutions who are under salary would demur at this unremunerative use of their brains.

[A. MCL. H.]

**Types of Insanity.** An Illustrated Guide to the Physical Diagnosis of Mental Disease. By ALLEN McLANE HAMILTON, M.D. Wm. Wood & Co.

This work comprises thirty-six pages of printed matter and ten plates. Nine of the plates are to illustrate the facial expression, attitude, etc., of the insane.

The following conditions are illustrated : Idiocy, imbecility, melancholia attonita, chronic melancholia, subacute mania, chronic mania, two cases of dementia, one case of general paralysis.

All that can be said of these plates is that they are very poor. The instantaneous photographs which the author tells us the plates were drawn from were probably good, but in their transfer they have undoubtedly lost very materially. In the plates you see no well-marked lines of facial expression, as are so often seen from the contraction of certain facial muscles. It is strange that there are so few illustrations of types of facial expression, attitude, etc. Two large asylums like Ward's Island and Blackwell's Island must contain ample material for illustrating every type and all varieties of facial expression. We find no plates to illustrate agitated melancholia (*melancholia agitans*) or monomania ambitious, *mégalomanie* (Dagonet). Each plate is accompanied by a page containing a very short description of the case. It is unfortunate that these histories and descriptions are so very imperfect ; it would have added much to the usefulness of the work if a concise description of the case, the clinical history, and the distinctive features of the type—mental as well as physical—had been given.

The text, consisting of thirty-six pages, is divided into five chapters, treating of the following subjects :

Chapter 1: On the general appearance of the insane—physiognomy, posture, conformation of the head, etc.

Chapter 2 : Condition of special organs—the eyes, the ears, the mouth and teeth, the tongue, the nose, etc.

Chapter 3 : On the condition of the bodily functions—the circulation, the temperature and pulse, variations of the skin and its appendages, muscular tonus, the reflexes, sensibility, the urinary secretion, menstruation, etc.

Chapter 4 : Examination of patient, changes in dress and personal habits, etc.; the handwriting of the insane.

Chapter 5 : The commitment of the insane ; abstract of the laws of the various States.

The subjects in each one of these chapters is treated in a very general manner and very briefly, and is not arranged in such a manner as to bring out prominently the connection between these physical symptoms and the types of insanity. This appears to me a defect, for when reference is made to the title of Dr. Hamilton's work it would seem that his object has been to aid his readers in arriving at a diagnosis of the types as far as that can be done by the physical signs alone. To illustrate what is meant a few lines will be quoted : "The condition of the skin and its appendages is worthy of study. The cutaneous surface is usually dry, harsh, and presents evidences of malnutrition. In rare instances there is profuse sweating, notably in acute mania ; but the action of the sweat-glands is feeble. In some forms of disease, acne, herpes, and certain bullous eruptions play a crisisogenic part, and disappear after each exacerbation." There is also another disadvantage in his arrangement. If one desires to learn the physical symptoms associated with melancholia he has to read the thirty-six pages, and finds what there is on the subject scattered through the work.

The expression "sexual insanities" appears several times in the work, whatever is meant by that.

In recent times there is apparently much activity in the study of mental diseases, if one can judge by the works which have appeared on the subject within the past six months. This may be the beginning of an active interest in the scientific study of these diseases in America, which has heretofore been so far behind other countries. This dawning activity should be encouraged, and whatever criticism is offered of these works and what appear to be defects pointed out, is done with the idea of stimulation, and not derogation, of the work ; and it is to be hoped that works like Dr. Hammond's and Dr. Hamilton's will do much toward creating an interest in the study of these diseases.

The idea of a portfolio of plates to illustrate the types of insanity is a good one, and, in spite of what appear to me defects, it will doubtless prove useful to physicians. [J. C. S.]

**The Principles and Practice of Surgery.** By D. HAYES AGNEW, M.D., LL.D., Professor of Surgery in the Medical Department of the University of Pennsylvania. Vol. iii, pp. 784. Lippincott & Co., Philadelphia, 1883.

This is the final volume of this work, the first of which was issued in 1878, and noticed in these ARCHIVES in February, 1879.

It contains chapters 24 to 37, and treats of the surgery of the trachea, nose, eye, ear, skin, nerves, mammary gland, lymphatic system, and muscles; of syphilis, deformities and malformations, tumors, electricity in surgical therapeutics, and massage. We note, in passing, the use of the word *orthopædia* in a new sense,—to indicate a class of diseases, as “the treatment of orthopædia,” a use which is to be deprecated as unnecessary and conflicting.

This volume shows the same thoroughness and attention to detail which characterized the first two, and which make the completed work the largest and fullest treatise on surgery in our language that has come from the pen of a single author. Large and full as it is, however, it must still rank as a compendium, and although some of its sections are veritable monographs, with a fulness of detail and statistics to which nothing could be added, yet on most subjects the surgeon who wishes for more information than that which is directly needed properly to treat a given case, must still turn to special articles or books, or to those voluminous works by many hands which are now issuing from the presses of Europe and America. An idea of the fulness with which the different topics are treated, may be obtained from the following comparisons: the chapter on Diseases and Injuries of the Blood-vessels occupies about two thirds of the space given to the same subject in the American edition of “Holmes’ System of Surgery”; the chapter on Fractures nearly two thirds of that in Hamilton or Stimson; and the chapter on Syphilis nearly three fourths of that in Van Buren and Keyes. For most practical purposes it is sufficiently full and detailed to serve the general practitioner as well as a small surgical library.

Detailed notice of the treatment of the different subjects is here impossible, and it would be unfair to the author and unpleasant to the reviewer to seek out for disapprobative mention, where there is so much to commend, those items of omission or com-

mission on which their judgments differ. And while perhaps no one has the right publicly to question the propriety of another's choice of work, we may be permitted to express the opinion that the industry, learning, careful observation, and large experience shown so constantly in this book, and to which we have already borne testimony, would have produced results of higher value, would have more advanced the science of surgery, if the author had limited his writing to fewer topics. But he has chosen differently, and he has produced a work which will always be valuable to its possessor, and will long remain an honorable monument to its author.

[L. A. S.]

**The Treatment of Wounds as Based on Evolutionary Laws.** By C. PITFIELD MITCHELL, M.R.C.S. New York: J. H. Vail & Co., 1883.

In this brochure of twenty-nine octavo pages, the author seeks to develop the argument of a previous essay—that in the Spenserian doctrine of evolution is found a guide to the treatment of wounds inflicted in the operations of surgery. Through a discussion, to which we must refer the reader, he arrives at the conclusion, that the system of Lister is philosophically wrong, and that drainage tubes, ligatures, etc., are prejudicial to the healing process. His is the “cleanliness” plan, with disregard of the atmosphere as a morbid agent. The road which the author has taken may not be to our judgment; but it is certain that he has reached a truth which, to-day, encourages and emboldens the surgeon, and crowns his work with success.

[J. V. D.]

**The Roller Bandage.** By WILLIAM BARTON HOPKINS, M.D. 12mo., pp. 95. Philadelphia: J. B. Lippincott & Co., 1883.

The object of this little book is to teach, by drawings from photographs and by brief text, the art of applying the roller bandage. Since so much of the intended instruction is expected of the pictures, we can only wonder why such poor specimens of the pictorial art were thought worthy for such service. We believe the art of bandaging can be learned from this, if from any, book, but of this the best evidence is in the experiment.

[J. V. D.]

**The Treatment of Wounds.** By LEWIS S. PILCHER, A.M., M.D. 8vo., pp. 391. New York: William Wood & Co., 1883.

Books on the treatment of wounds need no apology for their

appearance. The subject has reached such vast proportions, by such rapid strides, that the frequent appearance of works of the character of this is to be looked for. Well-grounded principles furnish a scientific basis for the methods of wound-treatment. The treatment of operation-wounds has attained a success which gives the operator unlimited boldness and adds to his triumphs. This book is divided into two parts, which treat, respectively, of The Principles and Practice of Wound-Treatment, and of Special Wounds. There is throughout the strictest enforcement of the rules which had their origin in the acceptance of the germ-theory of disturbance in the healing process. Hence, the investigations which relate to micro-organisms, asepsis and antisepsis, and wound-disinfection are fully set forth in as many chapters. Full tables are given, which show the relative value of germicides; and many pages are devoted to the discussion of corrosive sublimate, carbolic acid, subnitrate of bismuth, naphthaline, iodoform, etc. The author seems to accept the more advanced and recent beliefs in this department. His facts are the most recent in this as in the rest of the book, and the matter is well arranged. We could have wished that there was less reading to do, and that there was less reference to authorities by long and frequent quotations. The illustrations, one hundred and sixteen in number, are generally apt and fairly executed. The book belongs to Wood's Library of Standard Medical Authors. [J. V. D.]

### **The Dispensatory of the United States of America.**

By Dr. GEO. B. WOOD and Dr. FRANKLIN BACHE. Fifteenth edition. Rearranged, thoroughly revised, and largely rewritten, with illustrations. By H. C. WOOD, M.D., JOSEPH P. REMINGTON, Ph.G., and SAMUEL P. SADTLER, Ph.D., F.C.S. Phila.: J. B. Lippincott & Co., 1883. Pp., 1928.

A book of truly terrifying dimensions, and a perfect storehouse of chemical, botanical, and pharmacological facts of real scientific worth.

Its purely medical part, *i. e.*, the text under the heading "medical properties and uses," is the minor part, and this fact together with the bulk of the work will prevent its general use as a text-book. As a book of reference, it remains, as it always has been, invaluable. The physiological and therapeutical paragraphs have certainly brevity to recommend them, and this is a good deal, after seeing what an amount of space is given in some text-books to the almost endless discussion of questions which cannot be decided.

Among the references the almost entire absence of recent dates is very apparent. One can only infer from this that the work of revision is perhaps not quite so thorough as it might have been.

On page 124, last line, this rather remarkable statement appears : "It is very plain that so uncertain and powerful a remedy [aconitia] ought not to be used at all internally, \* \* \*"; and the *internal* use of the alkaloid in the treatment of neuralgia or *any* disease is not mentioned.

The word stasis for status, on p. 187, is undoubtedly an oversight. The doses of conium and its preparations, p. 487, seem ridiculously small—.20—.26. Hardly enough credit is given to the truly remarkable effect of viburnum in some cases of dysmenorrhœa, p. 1522.

Among the many excellencies of the work there are some glaring defects, and the most conspicuous and disheartening of these is the neglect, total in some places, of the metric system of weights and measures, and frequently of the centigrade thermometric scale.

At best the intention throughout is to make the metric system of secondary importance; its figures following those of the old system in brackets. In many places, as p. 1226, sixth line; p. 1227, twenty-first line; p. 1228, nineteenth and twenty-third lines, no metric equivalents at all are given; and the simplicity of translating from one system into the other is obscured by the frequent use of such clumsy numbers as 1.95 and 3.9 as the metric equivalent of one half and one drachm respectively.

The care with which the compiler of the pharmacological part of the book translates the metric weights and measures of the new pharmacopœia back into ounces and grains, without even giving the metric equivalents, is absurd, and relegates this part of the work to the dark ages.

The tone of such a work as this should be that of progress, not of blind conservatism.

The two hundred and twenty-four pages devoted to "drugs and medicines not officinal" form a sort of cyclopedic addition not devoid of interest or usefulness.

The twenty-nine pages closing the book comprise analyses of mineral-spring waters in this country and abroad, which are of great value.

[R. W. A.]

**A Practical Treatise on the Medical and Surgical Uses of Electricity.** Including : Localized and General Faradization ; Localized and General Galvanization ; Frankliniza-

tion ; Electrolysis and Galvano-Cautery. By GEO. M. BEARD, A.M., M.D., etc., and A. D. ROCKWELL, A.M., M.D., etc. Fourth edition, pp. 760. Revised by A. D. Rockwell, M.D. With nearly 200 illustrations. New York : Wm. Wood & Co., 1883.

To this fourth edition of "The Medical and Surgical Uses of Electricity," which we now have before us, very nearly the same remarks may be applied as those which followed the appearance of its predecessor.

To begin with, the book is altogether too voluminous to be of practical use to students and general practitioners ; perhaps it is better fitted for reference.

This enormous volume is divided into four parts, of which the first, treating of electro-physics, contains six chapters. The first chapter of this part is principally devoted to showing that "a knowledge of the principles of electro-physics is necessary to the electro-therapeutist" ; it also gives the definition of electricity and magnetism. Chapters II. and III. respectively treat of statical and voltaic electricity. In Chapter III., as an example of time and space wasted, we shall note that, while giving the early history of galvanism, our authors express themselves as follows :

"On observing this, it occurred to him [Galvani], that perhaps he had found a means of detecting atmospheric electricity more delicate than he had previously employed. In order to test this, Galvani took the dish of frogs, and, with his neighbor Camillo, went out on the terrace of his house. It was a clear evening in the early part of September, and no marked electric phenomena were apparent in the air. Fixing an iron hook in the spine of each frog, he suspended it from the iron railing.

"*Behold, spontaneous movements appeared in the frogs, various in their character and quite frequent!*" Besides, in a foot-note, the following : "At No. 96 in Strada S. Felice, Bologna, the house where Galvani lived, with terrace and railings, is still shown to travellers," (p. 42). Doubtless it is superfluous to remark that, however impressive this narration may be, it might have been left out with great advantage ; this, especially in a work which at each step professes to be strictly scientific. Chapter IV. treats of electrolysis, and in Chapter V. special notice is given to induced and thermo-electricity. Here again too much time is given to the description of induction, and while speaking of induction coils and electro-magnetic machines, there is so much repetition as to have led us to think of those books specially arranged for the teaching of children. At the same time we have also to deplore

that such short notice should have been given to thermo-electricity. At the present time, when every one is striving to secure exact measurement in scientific works, it is at least curious to see how the different kinds of measure are indiscriminately used, side by side, in the present volume. Thus, in one and the same page we read : " It is about fourteen inches in length (Ruhmkorff's coil). The inner coil is of copper, is about 2 mm. in diameter, and four or five yards long." A book which embodies so much pretention ought to be more precise.

Ohm's law and its practical application to electro-therapeutics, opens and closes Chapter VI. Eighteen full pages are used to show that : " Just as the strength of the theory of gravitation consists in its power to account for the movements of the solar system, just as the strength of the undulatory theory consists in its power to explain the complex phenomena of light, so the strength of Ohm's law consists in its power to account for the phenomena of dynamical electricity."

The second part of the work is divided into eleven chapters.

*The relation of electro-physiology to electro-therapeutics* begins Chapter I. of this part. Under the heading : " *Importance of a knowledge of electro-physiology to the electro-therapeutist,*" the authors rightly blame those who, in every-day practice, hold two sponges on the body of their patients, regardless of pole or position, quality or quantity. In Chapter III., which deals with electrotonus, after exposing at some length the peripolar arrangement which forms the basis of Dubois-Raymond's theory of electrotonus, a short notice is given to Pflüger's contraction law. The experiments by means of which Cyon succeeded in producing electrotonus in the nerve of living man are also mentioned. But those beautiful and most scientific experiments of Waller and de Watteville have been passed over in silence. This fact is rather surprising, and is, at the same time, to be regretted, as it appears that, notwithstanding the chaos which surrounded the phenomenon of electrotonus of nerves in man, Waller and de Watteville have been able to find their way to the most delicate and conclusive deductions. In such a review, it would be out of place to detail the method followed by these experimenters ; besides, to lay down the results arrived at, would require too much space ; we shall, therefore, have to refer the reader to their original works.

In Chapters III. and IV., the action of electricity on the skin, the brain, and spinal-cord is treated. It is impossible to follow the authors on this ground as it would occupy too much space ;

it will suffice us to state that the action of electricity on these parts is not as yet clearly understood.

The action of electricity on the sympathetic and pneumogastric is considered in Chapter V. Here we must stop to examine the results obtained by our authors. First, it is stated that "in external applications, it is the *derived* currents that pass through the nerves, and direct *polar* effect is not gained. . . .

"In our attempts to solve the problem, we have experimented on a large variety of individuals of different ages and by different methods of application. One of the electrodes is placed in the mastoid fossa, and the other over the seventh cervical vertebra, or at the top of the clavicle. Both directions of the current are used. We used in these experiments a zinc carbon, or the Smee's battery of from five to thirty cells, from one to five or ten minutes. The general results of our researches may be thus summed up :

"1. *A slight feeling of drowsiness,*" perceptible either shortly after the application of the electrodes, or not until the lapse of five or ten minutes after the *séance* ; the results were not constant.

"2. *A feeling of warmth through the system with sensible perspiration.*" (It is not stated whether the experiments were performed in warm weather or in a hot room.) Yet the symptom was not constant.

"3. *A marked effect on the pulse.*" Although the pulse was usually "lowered two, three, four, or more beats," it "was sometimes accelerated."

The "effect on external electrization through the neck on the retinal circulation," as verified by the authors and ophthalmologists, was as follows :

1. Galvanic or faradic currents being used on the sympathetic, contraction of the arteries or dilatation of the veins followed.

2. Faradic currents produced the same effect as the galvanic on the retinal circulation ; only this effect was produced more slowly with the faradic current.

3. The blood-vessels contracted under the influence of mild currents and short applications ; strong currents and long applications produced dilatation of these vessels.

4. In patients under certain influence,—as nervousness, etc.,—mild currents at once cause dilatation without previous contraction of the vessels.

5. The contraction is sometimes followed, a few minutes after the application, by dilatation greater than normal.

"6. The dilatation which takes place is sometimes followed by contraction after the close of the *stance*."

Considering the very rough way in which these experiments were made, it is scarcely necessary to state that they are unacceptable. Indeed, the evidence of contradiction with which all these conclusions are marked is too striking to need comment; yet the lamentable errors upon which all this depends might have been easily avoided. To discriminate between the use of the two poles and the seat of their application is an elementary fact with students in electro-therapeutics. Yet, in the present experiments, these poles are applied on the subject experimented upon indiscriminately; there is no indifferent electrode, both are active at the same time and almost on the same point! Among the many fruitful causes of error with which we have to deal while experimenting in electro-physiology, this indiscriminate use of the poles may be ranked first. Now, with such facts before us, our experimenters would lead us to believe that in these cases there was an anæmic state of the encephalon, and that this diminished current of blood was caused by electrization of the sympathetic in the neck! No proof, however, no explanation even, is offered.

In placing one electrode in the "mastoid fossa," and sending through it an electric current to the underlying tissues, it is surprising to know that this current had acted on the sympathetic only. It is just as if the current used had been sent with a special mission to affect in such and such a way only this or that nerve among many, leaving the others untouched.

On the other hand it is scarcely surprising that these experimenters should have obtained results so contradictory in the same experiment. As we have already pointed out, the position of the poles, the polar effect, the direction of the current, are facts of no little moment, and that in the present case have not been sufficiently dealt with. Doubtless the augmentation as well as the diminution oftentimes noted in the beats of the pulse might find an explanation in this lack of precaution. One of the poles being applied on the seventh cervical vertebra, the other in the mastoid fossa, it is clear that both the spinal cord on the one hand and the pneumogastric sympathetic on the other are excited at the same time; hence the effect of the more active of the two poles will be apt to show itself at the expense of the less active pole. Let us suppose, for example, that the kathode is in the "mastoid

fossa," and that it is the more active of the two poles ; it is probable that its effect in this position will affect the nerves underlying it. Now let it be placed on the spinal cord : in this new situation it will affect this organ at the expense of the anode which is the less active of the two poles ; hence, with the same electrode (*pole*) in different situations different effects are produced in the same organ. As for the after-effect of the current on these nerves, they might find an explanation in the very ingenious experiments of de Watteville and Waller, mentioned above.

Chapters VI. to XI. need not detain us at all. It will suffice us to mention that the nerves of special sense, motor and sensory nerves, muscles, etc., etc., and especially their reactions to electricity, are treated of.

Electro-therapeutics opens Part III. of this volume. As the space allowed us is limited, we shall not be able to devote much time to this part. A few points, however, need mentioning.

For example, in Chapter III., while speaking of the "differential action of the poles," it is stated : "It has specially been shown that the *anelectrotonic* region at the positive pole is in a condition of diminished, while the *catelectrotonic* region near the negative pole is in a condition of increased, irritability." This is a rather misleading if not incorrect statement.

It is known that (providing the polarizing and the exciting galvanic currents run in the same direction) both the cathodic and anodic closure excitations are greater in a nerve under the influence of the cathodic polarization than when in its normal state ; at the same time that the cathodic and anodic opening excitations produce less effect in the nerve than before polarization. We know also that for the prompt and unequivocal production of the phenomena, both the exciting and polarizing stimuli must traverse the nerve, as nearly as possible, at the same point ; it is to answer this purpose that de Watteville and Waller have devised to make both the stimulating and polarizing currents to pass through the same electrode. These experimenters have explained the above modifications taking place in an electrotonized nerve, by the creation of two electrodes of opposite name.

For example, let us suppose a *real* electrode, representing at the same time both the polarizing and the exciting kathodes of two galvanic currents. Now, if this *real* electrode be placed on the skin, as near as possible to an underlying nerve, at the passage of the polarizing current this nerve will be affected in such a way that it will have to suffer the influence of two currents of

opposite name at the same time. In that part of the nerve immediately underlying the skin will arise a *virtual* polar electrode of the same sign as the real electrode, while, owing to the rapid diffusion of the current, another electrode of the opposite sign will be formed all around the nerve; this electrode has received the name of *virtual peripolar* electrode. This disposition explains why, in the present case, the kathodic region is not *near*, as is stated in the work before us, but at the pole itself. In other words, in the present case, it is the *virtual polar* electrode which is in the kathelectrotonic region; while, on the contrary, the *virtual peripolar* electrode is in the anelectrotonic region, *i. e.*, in the region around or *near* the nerve.

In this same chapter, much stress is laid on the differential effect between current direction and polar application; yet the authors state that although the effect depending upon current direction is not "impossible," nevertheless, "if it be not entirely a myth, it is, to say the least, undemonstrated."

Here also we read that the liver, the stomach, the spleen, etc., when in a pathological state, can be easily affected by general faradization. Indeed, that general faradization affects these organs so easily, that it may assist us in determining the locality of certain of their diseases, if not their nature.

Now we come to the interesting chapter on electro-diagnosis. We notice that the questions relating to electro-muscular sensibility and contractility receive but little notice.

The following are given in order, as representing the law of contraction in normal muscles and nerves: 1. C. C. C.; 2. A. O. C.; 3. A. C. C.; 4. C. O. C. It is seen that the anodic opening contraction exceeds the anodic closure contraction. This statement, although partially correct in itself, however, would not stand rigorous tests, for this fact can be easily verified, that An. C. C. is most frequently equal to, if not greater than, A. O. C. We have seen above that with both the kathodic and anodic polarizations, the *anodic closure contraction is augmented*, while the *reverse is the case with the anodic opening contraction*. This reaction ought to be always kept in mind while testing normal muscles and nerves. One fact, however, will startle those who are somewhat familiar with the pathology and electro-diagnosis of bulbo-spinal diseases, and consequently deserves special mention.

Among the illustrative examples of diseases in which the reaction of degeneration is usually obtained, the authors have classed progressive muscular atrophy with traumatic paralysis of nerves,

lead paralysis, infantile paralysis, neuritis, etc. To those who have seen and examined electrically a case of progressive muscular atrophy, it is scarcely necessary to state that this stand-point is not tenable; on the other hand, we feel that we cannot too strongly warn students against expecting to gain reaction of degeneration in such cases. It is generally known, indeed, that in the great majority of *true* cases of progressive muscular atrophy (perhaps in all) the reaction of degeneration is not present; even faradic reaction is not lost, so long as there are sufficient muscular fibres left to answer the stimulus. Nevertheless, we do not forget that at a certain stage of the disease, toward the end, the reaction as excited by faradism may become slow, and sometimes vermicular, as if the muscular fibres reacted but reluctantly to the stimulus. This fact, which depends on the quantity of muscular fibres affected, and which is of the greatest importance, considered in a diagnostic point of view, is not to be assimilated, however, with the so-called *degeneration of reaction*. In spite of Erb's contradictory statements, we maintain that the change, in progressive muscular atrophy, as far as can be made out at present, is quantitative, but not qualitative, as those that may be present in the other diseases with which it has been erroneously associated.

The other chapters treat, respectively, of apparatuses and the way of using them, localized and general faradization, localized and central galvanization. The preference is given to general faradization and central galvanization over the local applications, and we learn that the best results registered by the authors have been obtained by the alternate use of these methods. However, it is with much pleasure that we note that the clumsy and unsafe method of galvano-faradization formerly used by the authors has been done away with.

In the chapter on static electricity it is seen that, in general, dynamic electricity is more valuable than the franklinic; nevertheless, in certain diseases, it is the belief of the authors that the latter is superior to dynamic electricity. Among such cases may be mentioned locomotor ataxia and systemic diseases of the spinal cord.

Chapters XV. to XXXVIII. are occupied with the relation of a multitude of cases (196) of all sorts of disease; most of which have either been cured or improved. It is truly painful to see 252 pages sacrificed to the report of badly recorded cases. To those students and general practitioners who will have to deal

with these cases we tender our sympathy ; for should they ever have to consult them for reference, or to elucidate some obscure case, they will certainly feel more embarrassed after the consultation than before. These cases are so arranged as not to allow of distinction between one disease and another. At the present time, when so many good treatises exist on almost every pathological state, it is a lamentable mistake for authors to strive to illustrate and enlarge their books with cases that have but a remote relation with the subject of their work ; it is more than this—it is confusing, misleading !

The fourth and last part of the book treats of electro-surgery. Here some of the different kinds of apparatus in common use are described ; the subject of electrolysis, especially “electrolyzing the base,” receives particular attention.

But perhaps the most interesting chapter in this book is the one treating of midwifery. We all know with how much anxiety we suspect extra-uterine pregnancy, for it has been the lot of all those who have had to deal with this abnormality to expect a fatal end ; but here we see the report of seven successive cases treated favorably by electrolysis. To say the least, it is more than we could have anticipated ; the profession must feel greatly indebted to Dr. Rockwell, with whom this bold operation originated.

In the chapter on galvano-cautery, after describing the different batteries and instruments in general use, the advantage of galvano-cautery over the actual and potential cautery and the ordinary operations with the knife are discussed. Then follow the rules governing the use of the galvano-cautery ; they are too numerous to find room here. Here twenty-seven more cases are reported, making in all two hundred and twenty-four cases (224 !). At last the book closes with a chapter on the miscellaneous surgical diseases which can be treated either by simple electrization, by galvano-cautery, or by electrolysis. [C. A.]

**A History of Tuberculosis, from the Time of Sylvius to the Present Day :** Being in Part a Translation, with Notes and Additions, from the German of D. Arnold Spina ; Containing also an Account of the Researches and Discoveries of Dr. Robert Koch and Other Recent Investigators. By ERIC E. SATTLER, M.D. Cincinnati : Robert Clarke & Co., 1883.

This little work gives, in its first five chapters, a summary of the different views regarding the nature of tuberculosis, with full references to the literary sources whence it is drawn, and, as such,

is valuable to any one interested in the historical part of the subject. These chapters are translated from Spina's work, and contain, besides a mere enumeration, criticisms by that author on the work of each investigator that he passes in review.

In the last four chapters Doctor Sattler has brought the subject down to the present date, giving a pretty full account of Spina's investigations of Koch's methods, by which the former claims to have disproved the etiological significance of the *bacillus tuberculosis*, together with Koch's reply to the same.

Doctor Sattler honors Spina by asserting him "to be a most formidable critic and opponent of the theories of Koch"; but if Spina cannot adduce better proofs than he does against Koch's theories, we fail to recognize in him any thing very formidable in the way of destructive criticism.

Spina seems to have been unfortunately inoculated with the spirit of his master, Stricker, who, during the past decade, has occupied himself chiefly in attacking the works of others in a small and carping spirit, and then when his criticisms did not meet with the attention he thought they deserved, raising a wail in the medical papers. Spina's methods, in marked contrast to those of Koch, are not of a kind to inspire with great confidence. They make the impression of having been instituted, not so much to discover the real truth of the subject as to belittle Koch. For our part, they seem to have failed in their object most signally.

[W. M.]

**Physical Exploration of the Lungs by Means of Auscultation and Percussion.** By AUSTIN FLINT, M.D., Professor of the Principles and Practice of Medicine and of Clinical Medicine in the Bellevue Hospital Medical College, New York. Henry C. Lea's Son & Co., Philadelphia, 1883. Pp. 83.

The work embraces the three lectures on the Physical Exploration of the Lungs delivered last winter by invitation before the Philadelphia County Medical Society. The first chapter, besides the introductory remarks, which include a pleasant sketch of the history of the subject, is devoted to elucidating the methods and results of percussion. The other two lectures deal with auscultation. In these he gives a description of the means employed to produce artificial illustrations of the signs obtained by examination of the lungs in these two ways, which are novel and suggestive.

The writer expresses the hope that he may succeed in showing

that what may be considered a hackneyed subject is one which, at the present time, claims attentive consideration, with reference to a further increase and a more general diffusion of the usefulness of its practical application in the diagnosis of disease. Those who read his book will concede unhesitatingly that he has accomplished his object, and will peruse its pages with the deference due to one who has made so long and so thorough a study of this method of determining thoracic disease.

If he succeeds in hastening the establishment of a uniform nomenclature which will be used by all writers and instructors of physical diagnosis in writing or speaking of the physical signs, he will receive a grateful tribute for having removed what he recognizes, as do all who study the subject, a great obstacle which retards the progress of the knowledge of auscultation and percussion, and limits their practical uses. [G. P.]

**Hygiene and Sanative Measures for Chronic Catarrhal Inflammation of the Nose, Throat, and Ears.** Sixteen illustrations, second edition. By THOMAS F. RUMBOLD, M.D., Professor of the Diseases of the Nose, Throat, and Ears, in the College for Medical Practitioners of St. Louis, Mo., etc. Medical Publishing Co., St. Louis, 1882. Pp. 190.

The necessity of explicit directions to patients is fully realized by Dr. Rumbold. They are given in the work under consideration with so much minuteness that one can see as if he were present the catarrhal victim who has been to the doctor for relief. He has had instilled into him a perfect fear of draughts and catching cold. If he is bald he wears a wig or a cap in the daytime; whether he is bald or not he puts on a night-cap at night, and insists that all his family shall do the same. He has been made aware that nature has provided the hair as a means of protection to the head, and that she should not be thwarted by the use of the scissors; he will discountenance the long locks of his daughters, and tell them that their massive coils will give them headache and catarrh. He will never have his hair shampooed because his doctor has told him that "it removes every particle of oil from the head, causing the scalp to become dry and full of dandruff, the hair to lose its glossiness and natural color, generally giving it a faded and lighter appearance; and because of the absence of the oil one is more liable to take cold on even a slight exposure of the head to a draught of cool air." He will use at least once a week plain vaseline on his head instead of the tradi-

tional bear's grease. He will wind around his neck a woollen comforter, and have nothing to do with a fur collar. He will wear "pulse-warmers" or wristers in winter. His shirt bands and shirt collar will fit him "so loosely that the four fingers of both hands can be inserted between them and the neck," because constriction of the neck will prevent a free circulation of the blood in the head, and will not only sustain but aggravate any congestion existing in the mucous membrane or other tissues."

In summer he is clad in under-garments of "stocking-knit goods." When the weather grows colder he puts on over these a second suit of thicker material. When the thermometer is at 13° F. he dons a third, and if, in cold weather, he goes on a journey, a fourth is drawn on over the others. These "supplemental suits" may be made, the doctor has told him, "of pure wool, cut and sewed from blue, yellow, white, or gray flannel." If he has shivers up and down his back, he wears a "back-protector," quilted, and half an inch thick.

This patient which we have in mind is of course weakly, so the doctor counsels him not to make a frequent change of under-clothing. He may wear the one next to his skin, "one, two, three, or more weeks." The doctor also tells him ablution should not be performed more frequently than the surface of the body requires cleansing, which probably will not be oftener than once in one or two weeks in warm weather, and once in four or eight weeks during the winter. Perhaps it may not be necessary to bathe at all during the cold weather.

Among other practical directions exercise in the gymnasium is spoken of as very desirable, and the necessity, which is illustrated by citing several striking cases, of preserving the temper if one would escape catarrh of the head, is also set forth.

The chapter on the use of tobacco is an interesting one. We have not space to review the seven heads under which he discusses its mental and moral effects, but refer to the fifth as the most original :

"The local effect of tobacco on the mucous membrane of the nose, throat, and ears, is as predisposing to catarrhal disease as is inefficient and insufficient clothing in the case of females."

He supports this statement by a table of 3,546 cases, the number treated by Dr. Rumbold in fifteen years. Up to the tenth year, both sexes being about equally exposed and protected, are equally affected—187 boys to 189 girls. From ten to fifteen, when boys are better clothed than girls, and have not begun

to use tobacco, the proportion was that of two of the latter to one of the former. From fifteen to thirty years, the proportion of females is still great, since with thin clothes they catch more colds than men in spite of their use of tobacco. From thirty to forty, the figures are reversed—seven hundred and forty males, six sevenths of whom used tobacco, to three hundred and seven females, who at this age have married, and learned to take care of themselves and dress sensibly.

As sanative measures, he classes cleansing the nose, for which he recommends snuffing up tepid water with salt, with the head in varying positions so as to reach all parts of the nasal cavity ; and the removal of hardened secretions by use of a catheter nasal douche. The inefficacy of the Weber's nasal douche he illustrates by covering with powdered starch the mucous membrane of both nasal cavities and then using a weak solution of iodine. The discolored portion of mucous membrane shows the greatest height reached by the iodide solution to be the antero-superior portion of the cavity. Aside from not cleansing, it has been Dr. Rumbold's experience in a number of cases that it increased the inflammation of the mucous membrane already involved, and caused irritation of the healthy adjacent tissues. The work concludes with similar chapters on the care of the ears and the teeth. These latter chapters may contain, for physicians not specialists, some useful suggestions.

To those who have not already well-defined views of their own with reference to the hygiene of catarrh,—and that most doctors have, one would be led to believe, from the frequency with which one hears in general society an opinion on the subject quoted, the introductory sentence always commencing, "*Our doctor says,*"—Dr. Rumbold's book will be valuable, since it will fit them out with a very definite and precise theory, which is calculated to appeal to the popular mind, as is evidenced by the fact that the book is in its second edition ; if one has not already been convinced by the account of it which we have given.

[G. P.]

**The International Encyclopædia of Surgery, a Systematic Treatise, etc.** Edited by JOHN ASHHURST, Jr., M.D., etc., in six volumes. Vol. III. New York : William Wood & Co., 1883.

A compendious article on *Injuries and Diseases of the Muscles, Tendons, and Fasciæ*, by Prof. Conner, of Cincinnati, opens the

volume. Compendious, because the several propositions of this well-explored field are disposed of in a rather summary manner, the histology of the repair of muscular and tendinous matter being wholly neglected. The classification of tenosynovitis is defective, as the terms *acute* and *chronic* alone do not do justice to the morbid conditions, and especially to the practical therapeutic bearings of the question. The suppurating and non-suppurating forms are not kept asunder as they ought to be, and thus the advice as to treatment lacks precision. We find enumerated as preventives of tendo-vaginal suppuration, the omnipresent poultice (more helpful to the surgeon than to the patient), local depletion, elastic compression, and even ligation of the main artery; but that most useful of antiphlogistics, *cold*, is not even mentioned. The chapters on paronychia, felon, and palmar abscess seem to be out of place, and belong rather to a treatise on the diseases of the hand. On the whole, the article is very readable.

The *Injuries and Surgical Diseases of the Lymphatics* receive due attention in a short paper by Edward Bellamy, F.R.C.S., of London. The author is abreast of the times. It seems that a regional enumeration of the surgically most important groups of lymphatics would have afforded Mr. Bellamy a fine opportunity to give the general practitioner some useful hints regarding the diagnosis and treatment of the different lesions of such glands.

The late Dr. John A. Lidell's monograph on the *Injuries of Blood-vessels* is one of the best portions of the volume. The simple, unaffected, yet withal virile style, even pathetic here and there, will impel the reader on and on to the end of the article. Aside from its scientific and practical importance, the surgeon of a humane and philosophical bent of mind must deeply feel the dramatic interest inherent to this matter, and the author's vast personal experience, his consummate knowledge of the literature of the subject, together with an impressionable yet impartial spirit, have enabled him to do full justice to it, and to produce a work that will be forever an honor to his profession.

Lidell did not lag behind the times, but to the last preserved a youthful interest in the remarkable strides taken by surgery in his declining years. To how many, otherwise worthy masters of the art, could he be held up in this respect as a shining example! All important statements of the author are borne out by illustrative cases fortified by reference, thus carrying conviction to the critical mind. The matter is free from pedantry, yet carefully systematized and sufficiently subdivided for easy reference.

Among the chemical hæmostatics the undeservedly neglected oil of turpentine is brought to notice, as being much preferable to the perchloride and persulphate of iron. Any one familiar with the surgical work of our city dispensaries will gladly join in the author's protest against the too frequent use of these preparations. A slight injury to the hand, accompanied by some arterial bleeding otherwise easily stopped by moderate compression, is freely bedaubed with the styptic. The result is a wide-spread phlegmon, disabling the member for weeks or forever.

The treatment of hemorrhage by compression and ligation, torsion, acupressure, and the other known methods is exhaustively considered, the author's sound and temperate judgment serving everywhere as a safe guide. The animal ligature is uncompromisingly accepted and recommended in conjunction with an antiseptic wound-management. The actual cautery and transfusion close the general part of the monograph.

Full of interest are the chapters treating of the injuries of special arteries; they contain a wealth of admirably selected and well-arranged cases under five headings, viz.: punctured, contused, lacerated, gunshot, and incised wounds of arteries. The general practitioner, on whose timely interference in cases of accident life so often depends, will find the perusal of the chapters on lacerated, punctured, and incised wounds of arteries of the greatest usefulness, and replete with the most valuable lessons.

The wounds of veins, their dangers, and their proper treatment, are next disposed of, after which follows a most excellent chapter on the wounds of the large cranial, thoracic, and pelvic vessels. It is recommended here to carry operative interference to the utmost verge of the limits which prudence enjoins, in order to secure the injured vessel above and below the injury. Otis' opinion, that it would be more rational to ligature even the vena cava or the aorta than to stuff the wounds with lint saturated with Monsel's solution, as has been done in more than one mortal hemorrhage, is approvingly quoted. The different forms of traumatic aneurism form the subject of the next chapter. Secondary hemorrhage is exhaustively considered, although nowadays the antiseptic treatment has rendered this bane of old-time surgery a rarity.

The article is concluded by a concise and clear enumeration of the important methods of deligating the several arteries of the human body, elucidated by a series of fine wood-cuts, mainly taken from Sédillot. It may be mentioned as a curiosity that the author distinguishes "Czerny of Vienna" from "Czerny of Hei-

delberg" (page 311), deeming them to be two different persons. The two are identical.

About the same time that this, his last literary effort, appeared, Lidell passed away from among the living. Few of the younger generation knew him; his death hardly made a ripple on the surface of time. Yet his name will be remembered as long as surgery will live.

Professor John A. Wyeth of New York, contributes a very meritorious article on *Surgical Diseases of the Vascular System*. It begins with phlebitis. The normal histology of the veins is carefully given, as is the behavior of the blood in health and disease of the vessel; but among the subdivisions of the process, a description of the important suppurative phlebitis is wanting, together with its gross and minute anatomy.

The author shows his powers to best advantage in the chapter on the diseases of the arteries, a field previously cultivated by him with great success, in his "Essays in Surgical Anatomy." It presents the latest phase of research, and is enriched by a number of new and well-done wood-cuts. Endarteritis, especially of the syphilitic kind; atheroma, not omitting even Weigert's "coagulation necrosis"; thrombosis and embolism, are lucidly and so explained that the non-scientific reader's attention will not flag on account of a dry verbiage:—a cardinal virtue too often missing in cyclopædic articles.

The value of the part relating to vascular tumors is much enhanced by a tabulated record of eighty-two cases of the deligation of the common, and of fifteen cases of the external carotid, artery. Their evidence throws welcome light on the question of the utility of deligation for vascular tumors. All the safe methods for curing angiomata are duly considered. An excellent chapter on varicose veins concludes the article.

The very special theme of *Aneurism* could not receive a more thorough-going and brilliant exponent than Richard Barwell, F.R.C.S., of London, whose name is favorably known on both sides of the Atlantic. The paper is throughout eminently practical, thus furnishing the general practitioner with just what is most needed,—that is, precise and clear guidance in a given concrete case. The style is a model of strictness and lucidity, and quite free from learned cant. Very interesting are the chapters on the causes of aneurism, the author's views being agreeably independent from the traditional superstitions found migrating from one surgical hand-book into the other.

An instance is the part played by syphilis in the causation of the disorder. Mr. Barwell's position seems here to be impregnable.<sup>1</sup> All important statements are borne out by exact reference, and a large number of carefully selected histories enliven rather than burden the delivery. Two curious cases of acute endarteritis are noted. The description of the symptoms of aneurism, but especially the consideration of the differential diagnosis, are splendid, showing the author's thorough mastery of his subject. Its progress and spontaneous cure complete the natural history of the malady, which thus serves as a rational foundation on which a system of treatment, medical and surgical, may be safely erected. Regarding the former, Mr. Barwell warmly recommends venesection, as an undeservedly neglected aid to produce anæmia and an increased coagulability of the blood.

All the methods of surgical treatment are carefully presented, ligation receiving, as a matter of course, most extended attention. Mr. Barwell's original proposition, respecting the use of the bovine aorta as a ligaturing material, will captivate the interest of every one familiar with the disadvantages of catgut and silk.

Finally, all important forms of aneurism are *seriatim* gone through, and the selection of the best therapy is carefully, but as decisively as the subject permits, indicated and directed.

Indeed, therein lies the author's main strength.

Mr. Barwell's experience of Davy's lever is not favorable, bruising and inflammation of the iliac vein having been observed after its use.

His greatest interest centres in the burning question of the treatment of the aneurisms of the aorta, and of those at the root of the neck; and his remarks respecting the nature of the different blood-currents within the arch of the aorta, and the practical conclusions, hinted at, not yet drawn therefrom, certainly deserve the most attentive consideration. The author's thorough knowledge of the new and old literature of the subject is apparent throughout.

His painstaking but nowise overwhelming use of statistics is commendable.

Professor M. Nicaise, of Paris, contributes an article on

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<sup>1</sup> Rheumatism, but especially chronic alcoholism, are accentuated as very common factors in producing aneurism, and the prevalence of the lesion in England, but foremost in Ireland, as compared with continental Europe, is directly ascribed to the "national love of strong liquor."

*Injuries and Diseases of Nerves*, very well translated by Dr. I. H. C. Limes, of Philadelphia. With the progress of knowledge regarding neural physiology and pathology, the surgical bearings of this branch of medicine have also undergone a marked change, well deserving the distinction of a separate article. After having become accustomed to the Gallic author's love of pedantic classification, the reader will find in the essay much general information of intrinsic interest.

The phenomena following injuries sustained by nerves are excellently depicted, likewise is neuralgia very well rendered. Nerve-tumors, tetanus, and a general consideration of the different surgical procedures applied to nerves, as there are the suture, elongation, finally neurotomy and neurectomy, close the essay. An article on special neural surgery would be a necessary complement of Professor Nicaise's paper.

The proof-reading was not as carefully done as in other parts of the volume.

Professor Edmund Andrews, M.D., LL.D., of Chicago, winds up the volume with a paper on *Injuries of the Joints*. In spite of its several defects the article will be found readable, mainly because the author has ideas of his own, and knows how to express them. He does not exhibit a wide acquaintance with the newer literature, and thus cannot be said to have compiled all that is valuable of contemporaneous knowledge of the matter in question; but he communicates to the reader his personal experience, which seems to have been extensive, and which, well told, must command interest.

*Farvis' adjuster*, a nearly obsolete apparatus, has been much and successfully used by Prof. Andrews, who calls it a most efficient means of treatment in dislocations, and deprecates the neglect into which it has fallen with the profession.

In going through the dislocations of the several joints, the author omits even a mention of the vertebral articulations. In a teacher this seems almost intentional.

Noteworthy is the author's success in curing a case of an upward dislocation of the sternal end of the clavicle (page 655).

Among the symptoms adduced as characteristic of fracture of the neck of the scapula, *lengthening* of the arm is not mentioned: a serious omission.

"*Luxatio erecta*" of the humerus is absent from among the dislocations of the shoulder; their reduction by manipulation is, "at present much in need of further trial, the evidence of its effi-

cacy being solely based upon the small number of cases reported by the advocates of these methods, *Prof. Henry H. Smith, of Philadelphia, and Prof. J. W. Hamilton, of Columbus*" (!). The experience of numerous foreign surgeons bearing on this matter seems to be to the author terra incognita.

Delightful is the little but unique history of a case in which Dr. Rice, a prominent physician of La Moille, Illinois, having declared a humeral dislocation of eighteen months' standing to be incurable, the reduction of this same dislocation was successfully effected nearly three years afterward by a *blind horse*. The curious will have to look up the original.

Although a sincere professor of the principles of antiseptic surgery, the author neglects the mention of that last resort of the modern surgeon in intractable cases of dislocation, namely, arthrotomy, ocular inspection, and operative removal of the impediments to reduction, eventually exsection of the joint. Volkmann, of Halle, has successfully introduced this line of practice, vastly preferable to the application of great force in attempting reduction of rebellious cases.

Bigelow's valuable contributions to our knowledge of the mechanism and treatment of the functions of the hip are deservedly praised and extensively used by Prof. Andrews, forming one of the best chapters of the article.

*En passant*, it may be mentioned, that the five or six wood-cuts taken from Bigelow are the only decent ones in the article; all the others being artistic monstrosities, and sad examples of the draughtsman's incapacity, or of Prof. Andrews' indulgent good-nature.

In discussing the statistics of the injuries of and operations about the ankle joint, it is said (page 710) that in the hospitals of Paris and Vienna "*a fearful mortality accompanies all surgical operations*," a statement entirely incorrect as far as Vienna since 1876 is concerned, where the results vie with those of any clinic. On that score, *our* public charities hold their own against all foreign competition.

"Bone-setting" receives the compliment of a distinct chapter, and well deserves it. Neglectful after-treatment of the numerous injuries affecting joints directly or otherwise has called forth and supplied with material the much-despised bone-setter. The anathema of the profession, even the law were helpless against him as long as he supplied what the educated physician did not offer. Since we have learned not to be content with a "cure" of a dis-

location or fracture, but continue the treatment till the *function* of the member has been reëstablished by means of careful orthopædic management, as breaking down of adhesions, passive and active motion, and massage, we hear less and less of the old-time bone-setter, and even Dal Cin's glory has waned.

Though Professor Agnew's "irritable joint" is mentioned, Brodie's articular neurosis simulating so many other morbid conditions is omitted.

The author's ideas respecting wounds and the effective form of drainage of the knee joint are excellent, and deserve the most extended attention and imitation. His remarks are based on a careful study of the normal anatomy of the joint, and boldly attack and dispel the superstitious fear surrounding this subject in the minds of a large number of physicians.

A rather rambling consideration of gunshot wounds of the joints closes the article, a matter, by the way, disposed of in the second volume, by Professor Conner, of Cincinnati. Herein, also, the statistics adduced are too ancient, and misleading as applied to modern surgery.

It may be truthfully said of this volume that no incompetent author found admittance to its pages. [A. G. G.]

**The Pathology and Treatment of Venereal Diseases.** By FREEMAN J. BUMSTEAD, M.D., LL.D., etc., and ROBERT W. TAYLOR, A.M., M.D., etc. Fifth edition, revised and rewritten, with many additions, by Dr. Taylor. Philadelphia: Henry C. Lea's Son & Co., 1883, octavo, 906 pp.

The fourth or preceding edition of this work was the joint production of both Dr. Bumstead and Dr. Taylor.

Dr. Bumstead being dead, it devolved on Dr. Taylor to re-write, revise, or enlarge the book as circumstances should require. This he has done in the present volume, changing and modifying the old material and making additions where required.

It is but just to the former edition to say that its general excellency left little to be asked; hence it is chiefly in additions which bring the work up to date that the present author shows his competency, making it thus really his book, and holding out bright promises for its future.

Two excellent chromo-lithographic plates, delineating various pathological conditions of the penis, chiefly sores, are among the additions, and begin the book.

Many valuable additions are found in the therapeutical part of

the book. Dr. Taylor lays special stress upon the beneficial effect of coca as an adjuvant in the treatment of the later stages of syphilis; simply as an *adjuvant*, not as one of the much-vaunted and ephemeral vegetable specifics, does the author call attention to this drug. He says (p. 873): "It is especially useful in the anæmia and cachexia of the secondary period. Given then, with the mercurial, the adynamic effects of the disease are averted." Again (p. 874): "Indeed, it seems that when this remedy is given mercury can be often used in larger doses, and is more efficacious than when it is not used. \* \* \* As is well known, in many subjects the benefits of treatment are more or less impaired, and often even lost, by reason of the patient's addiction to alcohol. \* \* \* Thus in practice I have often induced patients to cease drinking and to have no craving for alcohol, simply by giving them this agent, at first more frequently and in larger doses, and then, as the craving grew less, the dose could be made smaller." He prefers to give the coca in the form of the fluid extract in 2 c.c. doses with some bitter, as gentian or cinchona.

After reviewing the subject, the author speaks thus about the inoculation of animals with syphilis (p. 480): "The gist of the whole matter is this: That with the secretion of a hard chancre which has been irritated naturally or artificially, chancroids may be produced in animals, and that with the unirritated secretion or with portions of the chancre, we may produce something—perhaps syphilis and perhaps tuberculosis. The question may yet be settled by unprejudiced and enlightened syphilographers, who may or may not need the aid of experienced and dextrous mycologists."

The avoidance of the narration of many detailed cases is commendable, as is also the almost entire absence from the book of any thing to gratify prurient curiosity.

The author's touching tribute to the memory of his former colleague, Dr. Bumstead, is appropriate and deserved.

[A. W. R.]

## ORIGINAL OBSERVATIONS.

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### TWO CASES OF QUININE AMAUROSIS, FROM THE PRACTICE OF DR. C. R. AGNEW AND DR. D. WEBSTER.

By DAVID WEBSTER, M.D.,

PROFESSOR OF OPHTHALMOLOGY IN THE NEW YORK POLYCLINIC.

CASE 1.—Mr. A. G. W., aged twenty-three, student of theology, native of Georgia, consulted us on account of asthenopia on January 17, 1880. He stated that seven years previously he had a congestive chill. Large quantities of quinine, say half a dozen large doses, were administered to him during the night, and the next morning he was totally blind. He is positive that he was unable to discern the light with either eye. This total blindness lasted only three or four hours, and then the sight began to return gradually in both eyes, and the next day he could distinguish objects naturally. He thinks he has never seen as well since as before. He does not remember having experienced any colored vision or subjective sensations of light. He says the physicians gave him the quinine in such large quantities because they thought he would not survive a second congestive chill. The remedy produced the desired effect, for he has not had a chill since.

Right eye, vision =  $\frac{3}{8}$ , made  $\frac{3}{8}$  with  $+\frac{1}{8}$  c., axis  $90^{\circ}$ .

Left eye, vision =  $\frac{3}{8}$ ; not improved by glasses.

Ophthalmoscopically both eyes are normal, except that there are whitish bands running along the sides of the nasal branches of the left central retinal vein, and the optic disk of the same eye seems to be slightly paler than normal.

CASE 2.—Mrs. V., aged forty (?), came under observation January 13, 1880. Her history was given by her husband, a clergyman, as follows. She was ailing very much through the summer of 1879, having frequent attacks of cholera morbus, un-

til finally, on the early morning of Friday, July 25th, she had a very severe attack of the same, beginning, at two o'clock, with severe discharges, running into watery evacuations, until seven o'clock, when she had violent cramps in the lower leg, ankles, and feet. The feet were placed in hot water—almost boiling;—she was covered with mustard poultices over the whole chest and abdomen, and over the whole length of the spine, for over twelve hours. These were then removed and fly blisters were placed on the chest and stomach, and her legs and arms were rubbed continuously. The doctors said that her kidneys, liver, bowels, and brain were congested. After twelve o'clock (noon) on Friday quinine was administered *per rectum* in doses of fifteen grains every three hours. Her stomach refused every thing with desperate nausea until the following Sunday afternoon.

The quinine was given in enemas of milk and water, thin starch water, and beef tea, which also gave nourishment. In this way *one hundred and five* grains of quinine were given, when, on Saturday at noon, the physicians said that her pulse indicated that the quinine might be suspended. From the commencement of the attack until Sunday was passed (three days) she lay in a semi-unconscious state; intelligent when roused, but relapsing into quiet resting that was not sleep. The quinine was resumed in five-grain doses every three hours until twenty-five grains had been taken whenever there seemed to be any threatening of a return of the chill. She also has taken, ever since, a tonic, which gives five grains of quinine daily. On Sunday morning, the third day of the attack, she first became aware that she was blind. She was also *very deaf*, but the deafness passed away in a few days, as in other cases of deafness from quinine. On Monday evening she dimly discerned that there were five persons in her room, but only for a few moments. After this there was total "blankness" until the first week in September, when she dimly discovered a small spot of yellow on the window. After three or four weeks this assumed the form of a right angle, the outlines being lines of yellow light, apparently on a black background. And so from that time to the present the same process has been going on, more objects being outlined in lines of golden light, as on a black-board. She sees a circle of light, about a yard in diameter, when she looks at a lighted lamp or the sun, as if light were struggling to shine through a thick fog. She first saw only through the extreme outer corners of her eyes, and not at all in front. Gradually she has been discerning out-

lines in front. Now the objects seen on either side are dark, while those in front are still in the outlines of golden light.

Her eyes were examined by a competent physician on August 10th and 11th, and he pronounced her case one of "anæmia of the retina." He said that the retina was white, and the blood-vessels in it like white threads; that nothing but nutrition and new blood could remedy the trouble, and he hoped much from these.

Another ophthalmologist examined her eyes about the middle of October, and arrived at the same conclusion.

Present condition :

Right eye, vision =  $\frac{7}{300}$ .

Left eye, vision =  $\frac{7}{100}$ .

Ophthalmoscopic appearances : Disks perfectly white and arteries entirely obliterated and replaced by white lines; the very few minute retinal vessels have white lines along their sides. There are a few white, fleecy-looking connective-tissue changes in the retina near the disk and a mottled appearance of the choroid. The pupils dilate downward and outward nearly symmetrically, and there are deposits on the anterior capsules of the lenses.

The patient was given a course of hypodermic injections of nitrate of strychnia, but without apparent benefit.

In both the above cases the blindness was evidently due either to the "congestive chill" or to the poisonous effects of the quinine. After reading most of what has been published upon the subject of late, I am decidedly of the opinion that they were genuine cases of "quinine amaurosis." Extended remarks upon the subject seem to be uncalled for. Dr. Knapp has gone into the whole subject rather exhaustively in an article printed in Vol. X of the *Archives of Ophthalmology*, and to this I beg to refer those who wish to know more about it. I may just add that cases have been published by Graefe, Wecker, Roosa, Voorhies, Michel, Gruening, Baldwin, and Baumgarten, all of which are referred to and analyzed in Knapp's paper.

## INDEX.

---

- Agnew, D. Hayes. The Principles and Practice of Surgery. Review . . . . . 314
- Amaurosis from Quinine . . . 338
- Ashurst, John. The International Encyclopædia of Surgery, etc. Review . . . . . 329
- Bacteria and the Germ Theory of Disease. By H. Gradle. Review . . . . . 187
- Beard and Rockwell. A Practical Treatise on the Medical and Surgical Uses of Electricity. Review . . . . . 317
- Belfield, Wm. T. On the Relations of Micro-organisms to Disease. Review . . . . 187
- Buckham, T. R. Insanity Considered in its Medico-legal Relations. Review . . . . 310
- Bumstead and Taylor. The Pathology and Treatment of Venereal Diseases. Review . . . 336
- Climatic Treatment of Pulmonary Consumption, etc., etc. . 201
- Dispensary of the United States of America. Wood, Remington, and Sadler. Review . . 316
- Dyspnœa . . . . . 271
- EDES, ROBERT T. The Excretion of Phosphoric Acid by the Kidneys as Affected by Mental Labor . . . . . 41
- Electricity, Practical Treatise on Medical and Surgical Uses of. Review . . . . . 317
- ESKRIDGE, J. T. Case of General Neuralgia . . . . . 191
- Flint, Austin. Physical Exploration of the Lungs by Means of Auscultation and Percussion. Review . . . . . 326
- General Paralysis of the Insane, The Early Symptoms of . . 47
- Germ Theory of Disease . . . 176
- GOLDSMITH, W. B. The Early Symptoms of General Paralysis of the Insane . . . . . 47
- Gradle, H. Bacteria and the Germ Theory of Disease. Review . . . . . 187
- Gross, Samuel W. A Practical Treatise on Impotence, Sterility, and Allied Disorders of the Male Sexual Organs. Review . 308
- Gudden's Atrophy Method; and a Summary of its Results . . 126
- Gudden's Atrophy Method; and a Summary of its Results . . 235
- Gynecology, Practice of . . . 24
- HAMILTON, ALLAN McLANE. Upon Transferred Patellar-tendon Reflex . . . . . 302
- Hamilton, Allan McL. Types of Insanity. Review . . . 312
- Hammond, Wm. A. A Treatise on Insanity, etc. Review . . 78
- Hammond, Wm. A. Sexual Impotence in the Male. Review 310
- Harley, George. The Diseases of the Liver, with and without Jaundice, with the Special Ap-

- plication of Physiological Chemistry to their Diagnosis and Treatment. Review. . . 72
- HENRY, F. P. A Contribution to the Study of Icterus Neonatorum. . . . . 97
- Hip-Joint, Some Points on the Mechanics of the . . . . . 107
- Hopkins, W. B. The Roller Bandage. Review . . . . 315
- Hygiene of Nose, Throat, and Ears. Review . . . . . 327
- Hysteria, Two Cases of . . . . 88
- Hysteria, Unusual Symptoms of . 85
- Icterus Neonatorum, A Contribution to the Study of . . . 97
- Impotence in the Male. W. A. Hammond. Review . . . . 310
- Impotence, Sterility, etc., by S. W. Gross. Review . . . . 308
- Insanity, Types of. Allan McL. Hamilton. Review . . . . 312
- Insanity Considered in its Medico-legal Relations. T. R. Buckham. Review . . . . 310
- Insanity, its Causes and Prevention, by Dr. H. P. Stearns. Review . . . . . 83
- Insanity, A Treatise on, etc., by Wm. A. Hammond. Review. 78
- Internal Capsule, Diagnosis of Lesions Affecting . . . . . 1
- JACOBI, M. PUTNAM. An Address Delivered at the Commencement of the Woman's Medical College of the N. Y. Infirmary, May 30, 1883 . . . . . 59
- Liver, Diseases of, etc., etc., by George Harley. Review . . 72
- MENDELSON, WALTER. The Germ Theory of Disease . . . . 176
- Metallo-Therapy, Theoretically and Practically Considered, 155, 283
- Micro-organisms to Disease, On the Relations of. Wm. T. Belfield. Review . . . . 187
- Mitchell, C. P. The Treatment of Wounds, as Based on Evolutionary Laws. Review . . . 315
- Neuralgia, Case of General . . 191
- Osteitis Deformans . . . . . 146
- Pathogeny, First Lines in . . . 113
- PECKHAM, GRACE. Metallotherapy, Theoretically and Practically Considered . 155, 283
- Phosphoric Acid, The Excretion of, by the Kidneys as Affected by Mental Labor . . . . . 40
- Photo-micrographs, and How to Make Them, by George M. Sternberg. Review . . . . 188
- Physical Exploration of the Lungs by Means of Auscultation and Percussion. Review . . . 326
- Pilcher, Lewis S. The Treatment of Wounds. Review . . . . 315
- Practice of Gynecology in Institutions Designed for that Purpose . . . . . 24
- Quinine Amaurosis, Two Cases of 338
- RANNEY, AMBROSE L. The Internal Capsule of the Cerebrum and the Diagnosis of Lesions Affecting it . . . . . 1
- Roller Bandage, The. W. B. Hopkins. Review . . . . . 315
- Rumbold, Thos. F. Hygiene and Sanative Measures for Chronic Catarrhal Inflammation of the Throat, Nose, and Ears. Review . . . . . 327
- Sattler, Eric E. A History of Tuberculosis from the Time of Sylvius to the Present Day. Review . . . . . 325
- SEGUIN, E. C. Gudden's Atrophy Method, and a Summary of its Results . . . . . 126, 235
- SKENE, ALEX. J. C. The Practice of Gynecology in Institutions Designed for that Purpose 24

- Stearns, H. P. *Insanity, etc.* Review . . . . . 83
- Sternberg, Geo. M. *Photo-micrographs and How to Make Them.* Review . . . . . 188
- Surgery, *The International Encyclopædia of, etc.* John Ashurst. Review . . . . . 329
- Surgery, *The Principles and Practice of.* D. Hayes Agnew. Review . . . . . 314
- TEED, I. L. *First Lines in Pathogeny* . . . . . 113
- Tendon-reflex, *Upon Transferred Patellar* . . . . . 302
- Tuberculosis, *a History of.* Review . . . . . 325
- TYNDALE, J. H. *On the Relative Importance of Elevation, Dryness, and Equability of Temperature in the Climatic Treatment of Pulmonary Consumption* . . . . . 201
- Venereal Diseases, *The Pathology and Treatment of.* Bumstead and Taylor. Review . . . . 336
- WALKER, EDWIN. *An Unusual Hysterical Symptom-group.* . . 85
- WALTON, G. L. *Two Cases of Hysteria.* . . . . . 88
- WEBSTER, DAVID. *Two Cases of Quinine Amaurosis* . . . 338
- WESTBROOK, BENJ. F. *On Dyspnoea* . . . . . 271
- WIGHT, J. S. *Some Points on the Mechanics of the Hip-joint in Regard to the Treatment of Morbus Coxarius* . . . . . 106
- WIGHTMAN, S. J. *Osteitis Deformans* . . . . . 146
- Wounds, *The Treatment of.* Lewis S. Pilcher. Review . 315
- Wounds, *The Treatment of, as Based on Evolutionary Laws.* C. Pitfield Mitchell. Review . 315



# Archives of Medicine

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EDITED BY

E. C. SEGUIN, M.D. AND R. W. AMIDON, M.D.

S'il est possible de perfectionner l'espèce  
humaine, c'est dans la médecine qu'il faut  
en chercher les moyens.

—DESCARTES

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# ATONIC DYSPEPSIA.

BY J. MILNER FOTHERGILL, M.D., EDINBURGH,  
SCOTLAND; HONORARY M.D. RUSH MEDICAL  
COLLEGE, ILLINOIS; ASSOCIATE FELLOW  
OF THE COLLEGE OF PHYSICIANS  
OF PHILADELPHIA.

[Abstract of an original article, which may be found in  
the *Medical Record* of N. Y., Sept. 1, 1883—No. 609.]

\*\*\*\*\* It is necessary in all cases to keep the bowels open. There is no treating indigestion satisfactorily so long as the bowels are loaded with feces. The bowels must be swept out freely, and then kept open; and, if necessary, a sharp purgative must be given from time to time. Especially is this necessary with female patients, who dislike being purged (as it pulls them down), and who are very liable to allow themselves to become constipated. \*\*\*\*\* Either the medical man has paid too slight attention to the matter, or the patient has failed to carry out the orders, or, may be, both. Anyhow, the fact remains, and so does the indigestion for that matter, and the case is truly incurable until this is rectified. It is easily done, as a rule, by adding the requisite dose of laxative to the pill I am about to describe. It is well, however, to keep short of purgation, else the pill is abandoned, and its other effects lost. So keep on the short side a little, and let the patient take some laxative water the first thing in the morning, if indicated. But a good many patients dislike this water in the morning, and then it is well to prescribe two pill forms, one more sharply laxative than the other, and let the patients take one of each daily, or otherwise vary them according to their requirements. This does not give much trouble, and that is a matter agreeable and acceptable to the patient. Pills can be kept out of sight, and people, as a rule, object to be regarded as invalids. Besides—no little matter—pills are tasteless, and when the medicine has to be continued for weeks or months, if that medicine be nauseous the patient conceives a mortal repugnance to it.

When the symptoms of acute discomfort show themselves during and after a meal, then a dose of pepsin often makes matters comfortable (McKesson & Robbins' pepsin pill is most convenient), or a second may be indicated if the meal contain much meat. Such immediate measure is excellent, while the following pill is taken before meals, steadily and continuously. There are many hepatic stimulants, as mercury, arsenic, euonymin, baptisin, iridin, leptandrin, etc. But it may be questioned if any of them is so efficacious as ipecacuanha. A century of experience tells of the utility of ipecacuan in indigestion. It was a constituent of the dinner-pill of the last century. Not only does it stimulate the liver, and so be useful in cases of indigestion where there is either bile acids formed in excess or lithates present (that is, the peptones which find their way into the portal vein from the intestinal canal and which, converted into proteids, are elaborated into the albumen of the liquor sanguinis by the liver normally, and transformed instead into bile acids or urates; the patient loses flesh, and on a flesh dietary only makes more bile or more lithates, without gaining weight), but ipecacuan is a "pepsin-persuader" from its action on the

gastric lining membrane with its multitudinous glands and follicles. Ipecacuan combines properties, indeed, as does no other agent, in my opinion. Then there is often atony, either general or in the bowel, and for this strychnia is an admirable remedy. Perhaps, too, flatulence, for which a carminative is indicated. Then there is the vehicle, which may or may not be a laxative, according to the case. The pill would stand then somewhat as follows:

R Strychnia . . . . . gr.  $\frac{1}{80}$   
Pulv. ipecacuan. . . . . gr.  $\frac{1}{2}$   
Pulv. piper. nig. . . . . grs. jss.  
Ext. gentian. . . . . gr. j.

Yes, there it is! How familiar it does look; and what a lot of my patients are taking that pill with Pil. al. et myrrh., or Pil. coloc. co., according to their necessities! Once or twice a day before meals steadily followed out for weeks, with a pepsin pill, or maybe two, at dinner or other substantial meal, and a regulated dietary of farinaceous matter with milk. Steam-cooked cereals with milk, and a little fish or fat bacon to follow for breakfast. Lunch, a biscuit and milk, or a milk-pudding (made *without* an egg), with some stewed fruit, with a glass of wine. Then a walk before lunch and a rest on the sofa after. For dinner, some white meat with the milk-pudding and a glass of wine, with pleasant, cheerful society. Perhaps, if the patient be hungry in the night, some milk and malt extract, gently warmed and kept under a cosy (which both keeps it warm and untainted by the air of the bedroom), to be taken in the small hours of the morning. A bracing locality, and freedom from toil and worry.

This is about what I generally advise, and it seems to suit the patients, or else they tell me falsehoods and pay their fees in vain. Such, indeed, is the broad plan with dyspeptics suffering from inability to digest their food. Only the measures are to be fitted together in each case, as Opie mixed his colors—with brains!"

McK. & R. CONCENT. PEPSIN, 1 gr.

McK. & R. ANTI-DYSPEPSIA (Fothergill's).

Strychnia,	gr. 1-20
Pulv. Ipecac.	gr. 2-3
Pulv. Piper. Nig.,	grs. jss.
Ext. Gentian.,	gr. j.

McK. & R. ALOES & MYRRH. B. P., 3 grs.

Aloes Soc.,	1 gr.
Myrrha,	1-2 gr.
Crocus,	1-4 gr.
Conf. Rose,	1-4 grs.

McK. & R. ALOES & MYRRH. B. P., 5 grs.

Aloes Soc.,	1-2-3 grs.
Myrrha,	5-6 gr.
Crocus,	5-12 gr.
Conf. Rose,	2-1-12 grs.

McK. & R. COLOC. COMP., B. P., 4 grs.

Coloc. Pulv. Pulv.,	4-5 gr.
Aloes Barb. Pulv.,	1-3-5 grs.
Scammon. Virg. Pulv.,	1-3-5 grs.
Potass. Sulph., Ol. Caryoph.,	—

McK. & R. COLOC. COMP., B. P., 5 grs.

Coloc. Pulv. Pulv.,	1 gr.
Aloes Barb. Pulv.,	2 grs.
Scammon. Virg. Pulv.,	2 grs.
Potass. Sulph., Ol. Caryoph.,	—

McK. & R. Capsuled Pills may be obtained from all first-class druggists.

SPECIFY MCK. & R.

McKESSON & ROBBINS,  
Mfg. Chemists, 97 Fulton St., N. Y.

**BUY THE BEST!**

Highly recommended by the Medical Faculty of both America and Europe, and adopted by the United States Government. More of them Sold than any other Battery in the World.

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**THE FIRST AND ONLY PORTABLE BATTERY  
EVER INVENTED WHICH GIVES BOTH  
THE GALVANIC AND FARADIC CURRENT;  
THUS COMBINING  
TWO DISTINCT BATTERIES IN  
ONE CASE.**

**NO PHYSICIAN CAN AFFORD TO BE WITHOUT ONE.**

This Celebrated Battery is constructed on an improved plan. The zincs and carbons are fastened to hard-rubber plates in sections of six each; this manner of connecting brings the plates nearer together than in any other battery, thus giving less internal resistance. The rubber plate or cover will not warp or break, and is not affected by the fluid.

The cells are composed of one piece of hard rubber, and are made in sections of six each with a drip-cup; thus one section can be handled, emptied, and cleaned as easily and quickly as one cell.

The fluid cannot spill or run between the cells, and there is no danger of breaking as with glass cells. The drip-cup is to receive the elements when the battery is not in use. The Faradic coil is fastened to the hard-rubber plate or cover.

The rubber plate to which the zincs and carbons are attached is securely fastened over the cells when not in use, making it impossible for any of the fluid to be spilled in carrying.

An extra large cell (with a zinc and carbon element) is added to the combined batteries for the purpose of producing the Faradic current. This cell gives as much power as is ever needed, and avoids exhausting the current from the Galvanic cells.

Our Batteries weigh less, occupy less space, give a current of greater intensity and quantity than any other Battery manufactured. For simplicity of construction they cannot be surpassed, and any person reading our directions will have no trouble in operating them.

This is the only Battery in which the zinc and carbon plates can be kept clean and always in order by simply rinsing them.

All the metal work is finely nickel plated and highly polished, and every part is put together so that it can be easily replaced by the operator.

We have the most complete line of Electrodes yet offered to the profession. We also manufacture various styles of Table and Office Batteries, Bath Apparatus, etc., etc. Our manufacturing facilities are the largest of the kind in America, and we employ none but skilled mechanics and men of scientific experience.

Our Illustrated Catalogue, a handsome book giving full description of all our goods, and other valuable information, sent free on application.

**McINTOSH GALVANIC & FARADIC BATTERY CO.,**

**192 & 194 JACKSON STREET, CHICAGO, ILL.**

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## Dr. McINTOSH'S NATURAL UTERINE SUPPORTER.

**No Instrument has ever been placed before the Medical Profession  
which has given such Universal Satisfaction.**

*EVERY INDICATION OF UTERINE DISPLACEMENTS* is met by this combination: Prolapsus, Anteversion, Retroversion, and Flexions are overcome by this instrument, when others fail. This is proven by the fact that since its introduction to the Profession it has come into more general use than all other instruments combined.

*UNION OF EXTERNAL AND INTERNAL SUPPORT.*—The abdomen is held up by the broad morocco leather belt with concave front and elastic straps to buckle around the hips. The Uterine Support is a cup and stem made of highly polished hard rubber, very light and durable, shaped to fit the neck of the womb with openings for the secretions to pass out, as shown by the cuts. Cups are made with extended lips to correct flexions and versions of the womb.

*ADAPTABILITY TO VARYING POSITIONS OF THE BODY.*—The cup and stem are suspended from the belt by two soft elastic Rubber Tubes, which are fastened to the front of the belt by simple loops, pass down and through the stem of the cup and up to the back of the belt. These soft rubber tubes being elastic adapt themselves to all the varying positions of the body and perform the service of the ligaments of the womb.

*SELF-ADJUSTING.*—One of the many reasons which recommend this Supporter to the Physician is that it is self-adjusting. The Physician after applying it need have no fear that he will be called in haste to remove or readjust it (as is often the case with rings and various pessaries held in position by pressure against the vaginal wall), as the patient can remove it at will, and replace it without assistance.

It can be worn at all times, will not interfere with nature's necessities, will not corrode, and is lighter than metal. It will answer for all cases of Anteversion, Retroversion, or any Flexion of the womb, and is used by the leading Physicians with unfailing success, even in the most difficult cases.

**Our Reduced Prices are, to Physicians, \$6.00; to Patients, \$10.00.**

Instruments sent by mail at our risk, on receipt of price; or we can send by express, C. O. D., and collect return express on the money.



*CAUTION.*—We call particular attention of Physicians to the fact, that unscrupulous parties are manufacturing a worthless imitation of this supporter, and some dishonest dealers, for the sake of gain, are trying to sell them, knowing they are deceiving both Physician and patient.

#### PERSONS RECEIVING A SUPPORTER

will find, if it is genuine, the directions pasted in the cover of the box, with the head-line "Dr. L. D. McINTOSH'S NATURAL UTERINE SUPPORTER"; a cut on the right, showing the Supporter, and on the left its application, also the Fac-Simile Signature of Dr. L. D. McINTOSH. Each pad of the abdominal belt is stamped in gilt letters, Dr. McINTOSH'S NATURAL UTERINE SUPPORTER CO., CHICAGO, ILL. Each box also contains our pamphlet on "DISPLACEMENTS OF THE WOMB," and an extra pair of RUBBER TUBES. IT IS AN ADVANTAGE TO ORDER DIRECT FROM US as we exchange cups at any time without extra charge, and are able to fit any case that requires uterine support. The inventor, Dr. L. D. McINTOSH, is connected with the main office, and gives his personal attention to orders.

## Dr. McIntosh's Natural Uterine Supporter Co.,

192 & 194 Jackson Street, Chicago, Ill.

Our valuable pamphlet, "Some Practical Facts about Displacements of the Womb," will be sent you free on application.

FOR CONSUMPTION AND WASTING DISEASES.

# HYDROLEINE

HAS BEEN PROVED OF THE HIGHEST VALUE IN CONSUMPTION AND ALL WASTING DISEASES, INVARIABLY PRODUCING IMMEDIATE INCREASE IN FLESH AND WEIGHT.

## FORMULA OF HYDROLEINE.

*Each dose of two teaspoonfuls, equal to 120 drops, contains:*

Pure Cod-Liver Oil . . . . .	80 m. (drops).	Soda . . . . .	1-3 grains.
Distilled Water . . . . .	35 "	Boric Acid . . . . .	1-4 "
Soluble Pancreatin . . . . .	5 grains.	Hyochohic Acid . . . . .	1-20 "

DOSE.—Two teaspoonfuls alone, or mixed with twice the quantity of soft water, to be taken thrice daily with meals.

The principles upon which this discovery is based have been described in a treatise on "THE DIGESTION AND ASSIMILATION OF FATS IN THE HUMAN BODY," by H. C. BARTLETT, Ph. D., F. C. S., and the experiments which were made, together with cases illustrating the effect of Hydrated Oil in practice, are concisely stated in a treatise on "CONSUMPTION AND WASTING DISEASES," by G. OVEREND DREWRY, M.D.

In these treatises the Chemistry and Physiology of the Digestion of the Fats and Oils are made clear, not only by the description of a large number of experiments scientifically conducted, but by cases in which the deductions are most fully borne out by the results.

COPIES OF THESE VALUABLE WORKS WILL BE SENT FREE ON APPLICATION.

## HYDRATED OIL, HYDROLEINE, WATER AND OIL.

HYDROLEINE is readily tolerated by the most delicate stomachs, even when the pure Oil or the most carefully prepared Emulsions are rejected. The Oil is so treated with pancreatin, soda, boric and hyochohic acids, that the process of digestion is partially effected before the organs of the patient are called upon to act upon it. Consequently it is readily assimilated. It will nourish and produce increase in weight in those cases where oils or fats, not so treated, are difficult or impossible to digest. In CONSUMPTION and other WASTING DISEASES, the most prominent symptom is *emaciation*, of which the first is the starvation of the fatty tissues of the body, including the brain and nerves. This tendency to emaciation and loss of weight is arrested by the regular use of HYDROLEINE, which may be discontinued when the usual average weight has been permanently regained.

The permanence and perfection of the emulsion, and the extreme solubility of the HYDRATED OIL, solely prepared and sold by us under the name of HYDROLEINE, are shown by its retaining its cream-like condition as long as the purest Cod-Liver Oil will retain its sweetness. Unlike the preparations mentioned, or simple Cod-Liver Oil, it produces no unpleasant eructation or sense of nausea, and should be taken in such very much smaller doses, according to the directions, as will insure its complete assimilation; this, at the same time, renders its use economical in the highest degree.

To brain-workers of all classes, Hydrated Oil is invaluable, supplying, as it does, the true brain food.

Economical in use—certain in result. Tonic—Digestive and Highly Nutritive.

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FAT.

KIDDER & LAIRD, Agents for the United States,

Price at Retail, \$1.00 per Bottle.

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PRICES  
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We continue as for several years to supply **ANIMAL VIRUS** propagated at our own stables from lymph of the "Beaugency Stock," imported by ourselves expressly for this purpose. Results of experience enable us to recommend it as of unsurpassed excellence.

The establishment is under the care of a competent physician of long experience in this specialty, who will spare no pains to produce a perfectly *reliable* and *pure* article, which we are prepared at all times to furnish in *fresh* and *active* condition.

Our new method Kine Crusts will be found much superior to the ordinary form, though points are recommended as the most reliable form of virus attainable.

All our Virus is put up in strong, *air-tight, sealed packages* for safe conveyance by mail or express, and will be sent (post-paid if by mail) upon the following terms:—

Fifteen large Ivory Points, well charged on both sides	\$2 00
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Large Ivory Points, less than seven, well charged on both sides, each	25
One Crust, new method, in air-tight Glass Capsule, prepared for immediate use	0 00

Also **HUMANIZED VIRUS**, from **HEALTHY CHILDREN**, procured for us by physicians of undoubted reliability.

One Crust from Unruptured Vesicles (one remove from heifer if preferred)	\$2 00
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We will give a fresh supply in case of failure reported within twenty days for Points, thirty days for Human, and ninety days for Kine Crusts.

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Nos. 2 and 95, selected from one of the best English makers, by one of our firm; made expressly for us; warranted accurate, thoroughly seasoned, and very superior. Straight: self-registering; contraction in stem, to prevent loss of index; graduated to one-fifth degree.

No. 95 in addition to the above has patent lens front, causing the register to appear greatly magnified so as to be easily read; having plano-convex cross section it does not roll. Prices as follows:

No. 2.—In German Silver or in Ebony Case, 3, 3½, 4 and 5 inches long, each,	\$3 00
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No. 95.—In German Silver or in Ebony Case, 3, 3½, 4 and 5 inches long each,	3 50
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Postage, either, 4 cents,

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See other advertisements above, and in corresponding with Advertisers please mention this Journal.

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# L. WOLFF & CO., Manufacturing Chemists and Wholesale Druggists,

NORTHWEST CORNER 12TH AND CHESTNUT STS., PHILADELPHIA, PA.,

OFFER THE FOLLOWING SPECIALTIES TO PHYSICIANS.

**COPAHINE** Compound dragées of copaiba and cubebs; each dragée contains copaiba, oxidized with nitric acid gr. v.; powd. cubebs gr. x.; magnesia and sodium carbonate dry, each gr. j. A combination highly esteemed and used abroad, introduced here and improved by us, it forms one of the most elegant and efficient blennostatics recommended by many of our most celebrated practitioners in gonorrhoea, gleet, etc. DOSE, 2 to 4 dragées three to four times daily. It comes in boxes containing 75 each; retail price, \$t.00. This is not a patent or trade-mark preparation.

**PELLETS** both for internal administration and hypodermic use. These pellets were originated by Dr. L. Wolff and have found extensive application, being spoken of by authors as one of the most useful improvements in hypodermic medication. As made by us they are readily soluble in 10 minims of water, while imitations of our preparation are said to be much inferior in that respect. We manufacture all kinds and doses. As a novelty we offer special pellets for oral administration which enable physicians to dispense at the beds de. We prepare all kinds of powerful and concentrated drugs in this form.

## Pellets for the Detection of Sugar in Urine.

These represent 10 c.c. of Fehling's solution. Each one is complete without further addition. One pellet dissolved in a small quantity of urine in a spoon or test-tube is a most delicate reagent.

**OLEATES.** These classes of preparations, originated by us and introduced by Dr. J. V. Shoemaker in his well-known and celebrated paper, are true saturated Oleates. We claim for them originality, quality, purity, as well as moderate price. We manufacture those of Aluminium, Arsenicum, Bismuth, Cadmium, Copper, Iron, Lead, Mercury, Silver, Sodium, and Zinc (the latter in impalpable powder). Also oleates of alkaloids and oleic acid.

Physicians' orders for large or small quantities filled at lowest Wholesale rates.

SEND FOR PRICE LIST AND SAMPLES.

## METRIC TABLE.

*As the Metric System will be used in this Journal, the following Tables, for reference, are given for those not yet familiar with the system:*

METRIC MEASURES OF LENGTH.		METRIC WEIGHTS.	
1 Millimetre	0.001 = .039 inches	1 Milligram	0.001 = $\frac{1}{1000}$ gr.
1 Centimetre	0.01 = .393 "	1 Centigram	0.01 = $\frac{1}{100}$ "
1 Decimetre	0.1 = 3.937 "	1 Decigram	0.1 = $\frac{1}{10}$ "
1 METRE	1. = 39.370 "	1 GRAM	1. = 15.432
1 Kilometre	1000. = .62 miles	1 Kilogram	1000. = 2.7 lb.
APPROXIMATE EQUIVALENTS.		TEMPERATURE.	
1 ℥ or 1 gr.	= .06 grams	37° Cent.	= 98° 6 Fahr.
1 f 3 or 1 3	= 4. "	38° "	= 100° 4 "
1 f 3	= 30. "	39° "	= 102° 2 "
1 3	= 31. "	40° "	= 104° "
1 f 3 Glycerine	= 37. "	41° "	= 105° 8 "
1 f 3 Syrups	= 40. "	1° C. = 1° 8 F.	Multiply C. by 1.8 add 32 = F.

# MENSMAN'S PEPTONIZED BEEF TONIC.



The great necessity for a fluid food that would possess ALL THE ELEMENTS NECESSARY FOR THE SUPPORT OF THE SYSTEM having been long felt by the Medical Profession, we call attention to this preparation, containing the *entire nutritious properties* of the muscular fibre, blood, bone, and brain of a healthy bullock, dissolved by aid of heat and pepsin, and preserved by spirits; thus constituting a perfect nutritive, reconstructive tonic.

It is not a mere stimulant like the now fashionable extracts of beef, but contains blood-making, force-generating, and life self-sustaining properties, pre-eminently calculated to support the system under the exhausting and wasting process of fevers and other acute diseases, and to rebuild and recruit the tissues and forces, whether lost in the destructive march of such affections, or induced by overwork, general debility, or the more tedious forms of chronic disease. It is friendly and helpful to the most delicate stomach, and where there is a fair remnant to build on, will reconstruct the most shattered and enfeebled constitution. It is entirely free from any drugs. **DR. MENSMAN'S BEEF TONIC** is a complete representative of lean and fat beef, bone, blood, and muscle. It consists of all the properties which combine in the development of the animal body, which is liquefied by an artificial process, simulating a natural digestion, and retaining all of their alimentary values. It contains in their perfection all the natural elements of the meat in their natural quantitative relations, without their extraneous or indigestible properties, and therefore requiring the least possible effort on the part of the stomach for its conversion into chyle, and its immediate absorption by the system.

"This Tonic is free from any drugs or chemicals, and is a great invigorator and recuperant. I have used this preparation in several cases of sickness of a character which enables me to give the most favorable opinion of its great value in extreme sickness. Some of the cases referred to are hemorrhage of the bowels, typhoid fever, inflammation of the bowels, where the greatest possible prostration was present, and in which I found this meat tonic to accomplish results I could not obtain with any other preparation. It is a gentle stimulant, and allays the peculiar irritation of the stomach, which destroys the appetite in all forms of disease, when the tone of the stomach is destroyed.

"We published the above article in the November Number of 1877, and will say that we have prescribed the tonic daily to date with the very best results.—ED. MED. ECLECTIC.

## THE BEST THREE TONICS OF THE PHARMACOPŒIA; IRON, PHOSPHORUS AND CALISAYA.

We call attention of the profession to our preparation of the above estimable Tonics, as combined in our elegant and palatable **Ferro-Phosphorated Elixir of Calisaya Bark**, a combination of the Pyrophosphate of Iron and Calisaya never before attained, in which the nauseous inkiness of the Iron and astringency of the Calisaya are overcome without any injury to their active tonic principles, and blended into a beautiful Amber-colored Cordial, delicious to the taste and acceptable to the most delicate stomach. This preparation is made directly from the **ROYAL CALISAYA BARK**, not from ITS ALKALOIDS OR THEIR SALTS—being unlike other preparations called "Elixir of Calisaya and Iron," which are simply an Elixir of Quinine and Iron. Our Elixir can be depended upon as being a true Elixir of Calisaya Bark with Iron. Each dessert-spoonful contains seven and a half grains of Royal Calisaya Bark and two grains of Pyrophosphate of Iron.

## PURE COD-LIVER OIL,

Manufactured on the Sea-Shore from Fresh and Selected Livers.

The universal demand for Cod-Liver Oil that can be depended upon as strictly pure and scientifically prepared, having been long felt by the Medical Profession, we were induced to undertake its manufacture at the Flushing Station where the fish are brought to land every few hours, and the livers consequently are in great perfection.

This oil is manufactured by us on the sea-shore, with the greatest care, from fresh, healthy Livers, of the Cod only, without the aid of any chemicals, by the simplest possible process and lowest temperature by which the Oil can be separated from the cells of the Livers. It is nearly devoid of color, odor, and flavor—having a bland, fish-like and to most persons, not unpleasant taste. It is so sweet and pure that it can be retained by the stomach when other kinds fail, and patients soon become fond of it.

The secret of making good Cod-Liver Oil lies in the proper application of the proper degrees of heat: too much or too little will seriously injure the quality. Great attention to cleanliness is absolutely necessary to produce sweet Cod-Liver Oil. The rancid Oil found in the market is the make of manufacturers who are careless about these matters.

Prof. PARKER, of New York, says: "I have tried almost every other manufacturer's Oil, and give yours the decided preference."

Prof. HAYES, State Assayer of Massachusetts, after a full analysis of it, says: "It is the best for foreign or domestic use."

## Surgical Instrument Department.

Under the direct and personal supervision of **W. F. FORD**, Instrument Maker to St. Luke's Mt. Sinai, New York State Women's Hospitals, Bellevue, and all the other New York Hospitals.

### MANUFACTURERS, IMPORTERS, WHOLESALE AND RETAIL DEALERS IN

*Surgical, Dental, Orthopedic Instruments, Catheters, Trusses, Supporters, Silk Stockings, Ear Trumpets, Splints, Anatomical Preparations, Local Anesthesia Apparatus, Laryngoscopes, Ophthalmoscopes, Hypodermic Syringes, Axilla Thermometers, etc., etc.*

Special attention given to the manufacturing of Instruments to order, in exact accordance with patterns furnished by Surgeons and Physicians.

**CASWELL, HAZARD & CO.,**

Family and Manufacturing Chemists, New York.

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# BOKER'S BITTERS.

An experience of full half a century, which has elapsed since their introduction into this country has proved these Bitters to be the **most perfect Stomach Bitters** in existence. Being composed of the choicest and most carefully selected ingredients, all of which contain such medicinal properties as will benefit, and none of which could under any circumstances injure the system, they may be considered as almost an infallible remedy in all diseases arising from disarrangements of the digestive organs.

In cases of slight irregularities in the digestion, or of pains in the bowels, they will invariably afford immediate relief. They alleviate the most persistent cases of dyspepsia, and if judiciously used, they will cure them gradually and effectively. They have constantly proved a reliable preventive against fever and ague and the dreaded attacks of the cholera; and these diseases may even be cured, if recourse is had to these Bitters at the appearance of the first symptoms.

They may be taken either pure or dissolved in water (with or without sugar), and whilst a teaspoonful to a small tumbler of water will suffice for children, or persons of weakened constitution, adults and generally robust persons may take a quantity equal to one or two tablespoonsful at a time.

The **tonic, corrective, preventive** and **curative** properties of Boker's Bitters have always and everywhere proved as sure as efficacious.

For Sale by Druggists, Grocers, &c., and by

L. FUNKE, JR., Sole Agent

No. 78 John Street,

NEW YORK.

Post Office Box, 1029.

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## J. E. MOORE,

MANUFACTURER OF

### Sugar and Gelatine Coated Pills,

415 Broadway, Albany, N. Y.

ALSO JOBBER OF

ALBANY PHARMACEUTICAL COMPANY'S FLUID EXTRACTS, ELIXIRS AND SYRUPS,

SEABURY & JOHNSON'S PLASTERS, CORKS, ETC.

Special formulas of Pills made to order in quantities of 3,000 and upward.

PRICE LISTS AND ESTIMATES FURNISHED ON APPLICATION.

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# MALTINE.

MALTINE is a concentrated extract of malted Barley, Wheat and Oats. In its preparation the temperature does not exceed 150 deg. Fahr., thereby retaining all the nutritive and digestive agents unimpaired. Extracts of Malt are made from Barley alone, by the German process, which directs that the mash be heated to 212 deg. Fahr., thereby coagulating the Albuminoids and almost wholly destroying the starch digestive principle, Diastase.

## LIST OF MALTINE PREPARATIONS.

**MALTINE** (Plain).  
**MALTINE** with Hops.  
**MALTINE** with Alternatives.  
**MALTINE** with Beef and Iron.  
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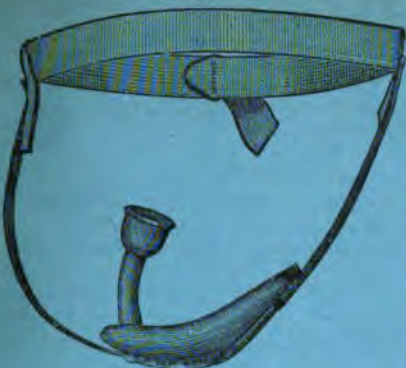
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### Index to Advertisements.

	PAGE
ATONIC DYSPEPSIA, . . . . . McKesson & Robbins, . . . . .	1
BATTERIES, Galvanic and Faradic, McIntosh G. & F. B. Co., . . . . .	2
BITTERS, Boker's, . . . . . L. Funke, Jr., . . . . .	8
BOOKS, Medical, etc., G. P. Putnam's Sons, 18,19,20,31,23,25,26,27,28,29, . . . . .	30,31
do do . . . . . P. Blaikiston, Son & Co., . . . . .	21
do do . . . . . C. Henri Leonard, M. D., . . . . .	13
COPALINE, PELLETS, OLEATES, S. Wolff & Co., . . . . .	6
COSMOLINE, . . . . . E. F. Houghton & Co., . . . . .	22
NORMAL LIQUIDS, . . . . . Parke, Davis & Co., . . . . .	4th Cover
FELLOWS' HYPOPHOSPHITES, . . . . .	32
HYDROLEINE, . . . . . Kidder & Laird, . . . . .	4
INSTRUMENTS, Surgical, . . . . . Geo. Tiemann & Co., . . . . .	17
JOURNAL OF NERVOUS AND MENTAL DISEASE, . . . . .	20
LACTOPEPTINE, . . . . . N. Y. Pharmacal Ass'n, . . . . .	3d Cover
MALTINE, . . . . . Reed & Carnrick, . . . . .	9
MEDICAL AND SURGICAL JOURNAL, . . . . .	14
MEDICAL JOURNAL AND EXAMINER, . . . . .	24
MINERAL WATERS, . . . . . Carl H. Schultz, . . . . .	2d Cover
NATURAL UTERINE SUPPORTER, McIntosh N. U. S. Co., . . . . .	3
PEPTINOIDS, Beef, . . . . . Reed & Carnrick, . . . . .	10
PHARMACEUTICAL PREPARATIONS, Caswell, Hazard & Co., . . . . .	7
PHILADELPHIA MEDICAL TIMES, . . . . .	12
PILLS, Sugar and Gelatine Coated, Jas. E. Moore, . . . . .	18
PILLS AND GRANULES, Soluble, W. H. Schieffelin & Co., . . . . .	17
SUPPORTERS, . . . . . H. G. Farr, . . . . .	11
THERMOMETERS, Clinical, . . . . . Codman & Shurtleff, . . . . .	6
VACCINE VIRUS, . . . . . Codman & Shurtleff, . . . . .	5

# TABLE OF CONTENTS.

For Metric Table see p. 13 of Advertisements.

## Original Articles.

	PAGE
J. HILGARD TYNDALE, M.D. On the Relative Importance of Elevation, Dryness, and Equability of Temperature in the Climatic Treatment of Pulmonary Consumption	201
E. C. SEGUIN, M.D. Gudden's Atrophy Method; and a Summary of its Results. (Second Paper.) ( <i>With two wood-cuts.</i> )	235
BENJ. F. WESTBROOK, M.D. On Dyspnoea	271
GRACE PECKHAM, M.D. Metallo-therapy, Theoretically and Practically Considered	283
ALLAN McLANE HAMILTON, M.D. Upon Transferred Patellar-Tendon Reflex	302

## Editorial Department.

Death of Dr. J. Marion-Sims	307
-----------------------------	-----

## New Books and Instruments.

A Practical Treatise on Impotence, Sterility, and Allied Disorders of the Male Sexual Organs. By SAMUEL W. GROSS, A.M., M.D.	308
Sexual Impotence in the Male. By WILLIAM A. HAMMOND, M.D.	310
Insanity Considered in its Medico-Legal Relations. By T. R. BUCKHAM, A.M., M.D.	310
Types of Insanity. By ALLEN McLANE HAMILTON, M.D.	312
The Principles and Practice of Surgery. By D. HAYES AGNEW, M.D., LL.D.	314
The Treatment of Wounds as Based on Evolutionary Laws. By C. PITFIELD MITCHELL, M.R.C.S.	315
The Roller Bandage. By WILLIAM BARTON HOPKINS, M.D.	315
The Treatment of Wounds. By LEWIS S. PILCHER, A.M., M.D.	315
The Dispensatory of the United States of America. By Dr. GEO. B. WOOD and Dr. FRANKLIN BACHE	316
A Practical Treatise on the Medical and Surgical Uses of Electricity. By GEO. M. BEARD, A.M., M.D., etc., and A. D. ROCKWELL, A.M., M.D., etc.	317
A History of Tuberculosis, from the Time of Sylvius to the Present Day. By ERIC E. SATTLER, M.D.	325
Physical Exploration of the Lungs by Means of Auscultation and Percussion. By AUSTIN FLINT, M.D.	326
Hygiene and Sanative Measures for Chronic Catarrhal Inflammation of the Nose, Throat, and Ears. By THOMAS F. RUMFOLD, M.D.	327
The International Encyclopædia of Surgery, a Systematic Treatise, etc. By JOHN ASH-HURST, Jr., M.D., etc.	329
The Pathology and Treatment of Venereal Diseases. By FREEMAN J. BUMSTEAD, M.D., LL.D., etc., and ROBERT W. TAYLOR, A.M., M.D., etc.	336

## Original Observations.

Two Cases of Quinine Amaurosis, from the Practice of Dr. C. R. Agnew and Dr. D. Webster. By DAVID WEBSTER, M.D.	338
---	-----

Index	341
-------	-----

The attention of Physicians is specially invited to page 15 of Advertisements.

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